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The Canadian Seed Growers' Association and its work

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CONSTITUTION, BY-LAWS AND REGULATIONS

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CANADIAN SEED GROWERS' ASSOCIATION.

HEAD OFFICE, CANADIAN BUILDING, OTTAWA, ONTARIO.

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Auditors—E. D. Eddy, Ottawa, Ont., and The Accountant, Department of Agriculture, Ottawa, Ont.

NOTE—Since the officers are elected annually, the above list is subject to change.

PART I.

SOME CONSIDERATIONS REGARDING THE SEED QUESTION.

Before discussing the work of the Association in detail, a few matters of general interest regarding the seed question as a whole will be considered.

According to the reports of the Census and Statistics Branch of the Department of Trade of Commerce, over forty million bushels of seed are required annually in Canada to produce our ordinary farm crops, namely Spring and Autumn wheat, oats, barley, pease, corn and potatoes. The amount used in each Province is approximately as follows:—

Seed Used Annually in Canada.

Alberta, 3¾ million bushels; Saskatchewan, 12½ million bushels;
Manitoba, 3¾ million bushels; Ontario, 11¾ million bushels;
Quebec, 5½ million bush; New Brunswick, 1 million bushels;
Nova Scotia and Prince Edward Island, 800 thousand bushels each.

Average yields of farm crops in Canada.—Notwithstanding the immense total production realized from the above sowing, an examination of the returns reveals the significant fact that the average yield per acre is unnecessarily low as compared with that obtained by our best farmers. Thus, the average yield of Spring Wheat per acre for all Canada is only about 19 bushels; that of oats 35 bushels, that of barley about 28 bushels, and that of potatoes about 124 bushels. Many of our best farmers grow from 25 to 35 bushels of wheat, from 65 to 100 bushels of oats, from 40 to 50 bushels of barley and from 300 to 450 bushels of potatoes per acre. From this it is evident that the full producing power of the acre on the average farm is seldom reached.

Means of Increasing Production per Acre.—The production per acre may be increased in four main ways, viz.:—(1) By the improvement of soil fertility; (2) by the improvement in methods of cultivation and crop rotation; (3) by the prevention of injury by weeds, insects and plant diseases and (4) by the use of better seed. It is in the last of these various means of progress that the Canadian Seed Growers' Association is primarily interested, although, in the attainment of its end, the Association must necessarily observe all of the essentials of successful crop raising.

It is only necessary to visit our local seed exhibitions, or, what is still more convincing, to examine the contents of the grain drill at seeding time on the average Canadian farm to find tangible evidence of the fact that the quality of seed which is still in common use is much inferior to what it should be. The continued use of inferior seed is due to a variety of causes but perhaps more especially to the failure of the average farmer to appreciate as fully as he should the part which the seed plays in determining yield and quality in crops. The following elaboration of the various attributes of "Good Seed" should serve to emphasize the great importance, first of making a careful *choice of variety*, and secondly, of *obtaining the best quality of seed* of that variety.

Good Seed Defined.

I. 'Good Seed' may be defined as follows:—Seed *belonging to a variety* which is superior in the following respects, viz.:—

1. Suitability for the conditions under which it is to be grown.
2. Yielding power.
3. Purity.
4. Quality of product for marketing or feeding purposes.
5. Hardiness.
6. Strength of straw or stalk.
7. Ability to resist disease.

II. Seed which *in itself* is superior in the following respects, viz.:—

1. Vital energy.
2. Size and development of kernels.
3. Uniformity of sample as regards size and development of kernel.
4. Maturity.
5. Freedom from disease.
6. Freedom from other damage of any kind.
7. Freedom from weed seeds.
8. Freedom from seeds of other cultivated kinds or varieties.

I.—CONCERNING CHOICE OF VARIETY.

1. The suitability of a sort for the conditions under which it is to be grown is a matter deserving of the most careful consideration. Certain sorts thrive better on clay soils than on soils which are lighter, and vice versa; some thrive better on moist soils than others, while some may be less sensitive to soil and climatic conditions than are other sorts. Marked differences often exist between different sorts in regard to number of days required to attain maturity. Under certain conditions early maturing sorts are an advantage. Under other conditions they are practically a necessity. The great importance of choosing the best available sort suggests at once the desirability of testing a number of those sorts which are most highly recommended by the Experimental Stations before deciding which should be grown as a main crop. Where a district is growing grain for seed, it will attain a reputation much more quickly where the number of sorts is limited than where many are being handled. The ability to purchase seed of any one variety in large quantities in a single centre is a matter which always appeals to the large buyer.

2. Yielding Power :—Decided differences often exist between sorts in yielding power. Many sorts have been discredited through unfair judgment; others have obtained a wide distribution because of conditions which were purely accidental. The enormous influence on crops of such agencies as season, soil, manuring, cultivation and quality of seed used, demands that great care be taken in the testing of sorts lest the results be incorrectly interpreted. In any case only the average results over a number of years can be accepted as a fair expression of the yielding power of a given sort.

3. Purity of Variety :—The possible advantages of pure sorts over those varieties which contain two or more different strains are worthy of note. In pure sorts all plants require practically the same conditions for germination and possess the same power of utilizing plant food; they exhibit likewise the same attitude toward soil and climatic conditions and toward disease. The result is that if the soil conditions are uniform, the growth is uniformly even throughout the season and the maturity of all plants will take place practically at the same time. Experiments conducted at different experimental stations go to show that the largest yields are obtainable from seed which is allowed to mature perfectly before cutting. If, therefore, the variety contains a mixture of late and early strains, the best quality of seed cannot be expected. Should harvesting be delayed in order to allow the latest strains to mature, the earlier strains will be "dead ripe" and shelling out before those which mature later are fit to cut. This may entail considerable loss.

Pure sorts have another advantage over those which are mixed in that their botanical characters are relatively constant and therefore are more clearly defined and more easily recognized. This facilitates a much better control over seed and enables a more accurate determination to be made in regard to its genuineness. This is an important feature both for the seed dealer and for the buyer, as well as for the judge at exhibitions.

Mixed varieties, consisting as they do of a number of distinct strains of varying practical values in regard not only to time of ripening but to yield ing power, stiffness of straw and resistance to disease, are likely to give a product of less value than that of pure sorts. These varieties may however, *under certain circumstances* have their advantages. Thus a variety may contain strains which differ from each other chiefly in their attitudes towards different conditions of soil and season. They may be almost identical in appearance, may ripen simultaneously, may possess the same stiffness of straw and the same resistance against disease yet one may thrive best on soils which are lighter, warmer and drier while another may give better results on a heavier, colder and moister soil. Were a variety of such composition sown on a field in which the soil is exceedingly variable, it is conceivable that a better average might be obtained than from an absolutely pure sort which demands more exact conditions. The difficulty of knowing the real nature of the strains which go to make up a mixed variety is such, however, as to render it an unsafe practice to depend upon the possible virtues of a composite race.

4. Quality in a sort is a very important character and should be carefully considered when a choice of variety is being made. In wheats very considerable differences exist between different sorts in regard to the quality of flour they produce. In oats the percentage of hull to kernel, which in this case is the common measure of quality, differs to a marked degree in different sorts. In fodder crops the quality of fodder produced by different varieties often exhibits marked differences. Determinations of quality on the basis of general appearances are frequently misleading. Thus, size and plumpness in oats often beguiles growers into introducing sorts which actually possess a high per cent. of hull to kernel. A good example is afforded in the "Tartar King" variety. In corn, ensilage varieties are too often judged on the basis of total volume rather than upon the quality of ensilage produced.

5. Hardiness.—In autumn sown crops, the matter of hardiness or ability to withstand the severe conditions of winter and early spring is an important character. The differences between different autumn wheat sorts, for example, in regard to hardiness is often very considerable, and should be duly observed in making a choice of sorts.

6. Strength of Straw.—The difference between sorts in this regard is noteworthy and should be taken into consideration when making a choice of sort. On poorer soils the danger from lodging is not so great as on soils in a high state of fertility. In the latter case a stiff strawed sort is of special value.

7. The Ability to Withstand or Resist Disease is an important quality. Some sorts seem much more susceptible than others to such diseases as rust, smut and blight.

II.—CONCERNING CHOICE OF SEED OF CHOSEN VARIETY.

1. **Vital Energy.**—High vital energy in seed or its power to germinate and develop into a strong, vigorous plant is naturally a matter of the very first importance. The fact that a seed may be able to germinate and at the same time possess a low degree of vital energy renders it impossible by means of germination tests to determine fully its ability to develop into a strong vigorous plant. Germination tests are valuable however in showing the percentage of seed that will germinate under favorable conditions and thus in providing a clue as to its fitness to be used as seed. When the percentage germination is high after the tests have been running for four days in the case of cereals, clovers and many other kinds of seed, the 'vital energy' is found to be higher than where the per cent. germination in four days is low even though the final count after ten days shows a fairly high per cent. The percentage germination may easily be determined by placing 200 kernels in soil or sand or between sheets of blotting paper and keeping them moist and sufficiently warm for from 8 to 12 days or longer depending upon the kind of seed under consideration. From the number which germinate, the per cent germination may be quickly reckoned.

In corn, each ear should be tested. This can be done by taking a sample of six kernels from each ear and testing each lot separately.

2. Seed Should be Plump and Large for the Sort.—Each seed consists of a germ or embryo surrounded by reserve food. Under proper conditions the embryo begins to grow and we have what is popularly known as 'germination of the seed.' During the early stages of growth the necessary plant food is obtained by the young plant from the reserve material contained in the seed for this purpose. Should the conditions of soil or season be unfavorable for early growth and should the seed be undersized or poorly developed, there may not be sufficient food to give the young plant a proper start. Under such conditions the development of the plant shall be weak from the beginning. Investigation shows that plants, like animals, when stunted at the start cannot attain their normal thriftiness—even though subsequent conditions be favorable. The experimental evidence obtained from different sources as to the superiority of large, well-developed seed is abundant. This evidence way be summarized in the following manner:—

(a) Plants from poorly developed seeds are likely to be less vigorous and consequently less productive.

(b) Such plants usually require a longer time to develop and may therefore mature later.

(c) They are more easily weakened or destroyed by insects and diseases.

The size of kernel is of course a relative consideration since some sorts naturally produce smaller kernels than do others. "Gold Rain" oats, for example, produces a smaller kernel than does "Ligowo" or "White Probestier." The size of kernel by which a sort is characterized has no definite influence upon the value of the sort as such. Certain large kernelled sorts of wheat and oats, for example, are less productive than are other sorts which normally produce a small kernel. The reverse may likewise be the case.

In the case of oats the "secondary" kernels are usually smaller than are the "primary." They have also a thinner hull. Investigations made by the Association with different varieties has shown there to be approximately seven pounds of hull less in 100 pounds of secondary oats than in the same weight of primary oats. This fact provides two arguments in favor of the severe grading of oats for seeding purposes. In the first place, the removal of the smaller secondary kernels leaves a sample composed of the larger primary kernels which on account of their size are likely to give better results when used for seed. This does not necessarily imply that by sowing better seed a lighter seeding is required per acre. In the second place, the secondary kernels secured as screenings from the fanning mill are more valuable for feeding purposes than are the primary kernels. In some countries, indeed, a higher price is paid for secondary kernels (screenings) for horse feed than for oats which have not been graded. By the severe grading of oats, therefore, not only is nothing lost but two positive gains may be realized.

Where it is necessary to use seed from a "mixed" variety containing, as it may, large and small grained strains, it is considered safer practice to use seed of average size rather than the very largest seed. In pure sorts, on the other hand, the largest seed that may be obtained should always be sought for.

3. The seed sown should consist of kernels which are as nearly alike as possible as regards size, shape and development.—Where the seed sown consists of large, small and poorly developed kernels, the resulting crop is likely to consist of a mixture of weak and strong plants. During the growing season the weak individuals become more and more suppressed by the stronger so that the stand becomes thinner than it should be. The strong plants, moreover, mature as a rule, before the weaker, the result of which is that not only is the quality inferior but the crop is likewise reduced.

4. Seed should be perfectly matured.—Perfect maturity is indicated by the hardness, color and plumpness of the seed. Seed which is perfectly matured before harvesting has been found to give larger yields when sown than does seed taken from a crop which has been cut on the green side.

5. Seed should be free from disease.—The most common disease affecting cereals is smut. The Dominion Botanist, Mr. H. T. Güssow, has

recently published an extensive account of Smut diseases of cultivated plants and how to combat them (Bulletin 73 of the Experimental Farm Series). This bulletin is a most valuable one and should be in the hands of every grain grower and member of the Association. It may be obtained free of charge by writing the Publications Branch, Dept. Agriculture, Ottawa.

Potato Diseases.—The most destructive potato diseases are the "Scabs" and "Blights." For a description of these diseases together with an outline as to how best to combat them the reader is referred to the following literature, all of which are available free of charge at the Publications Branch, Dept. Agriculture, Ottawa:—

(a) The Potato and Its Culture (Bulletin 49 Experimental Farm series), by W. T. Macoun, Ottawa.

(b) Potato diseases transmitted by the use of unsound seed potatoes. (Circular No. 4, Experimental Farm series), by H. T. Güssow, Ottawa.

(c) Potato Canker. (Bulletin No. 63 Experimental Farm series), by H. T. Güssow, Ottawa, Ont.

(d) The Powdery Scab of Potatoes. (Farmer's Circular No. 3, Exmental Farm series), by J. W. Eastham, Ottawa, Ont.

6. Seed should be free from damage of any kind.—Injuries frequently follow neglect to keep seed dry. Where this precaution is ignored moulds frequently develop, causing a lowering of the growing power. Care should also be taken in threshing seed in order to avoid breaking the kernel and thereby injuring the germ. It is a dangerous practise to thresh severely, or by other means "clip" the kernels, a practice which is frequently followed for the purpose of making the grain pack more closely in the measure, thus weighing heavier per bushel. This is especially dangerous in the case of barley, which is very brittle and liable to break.

REGARDING THE CHANGING OF SEED.

It has been claimed by some that seed should be changed every few years, no matter under what condition it may have been produced. Others claim that seed to be sown on light soil should be secured from a crop produced on heavy soils and vice versa. Others claim that only under the most exceptional conditions should seed be changed. While all of these views cannot be correct in their entirety, yet there is a certain amount of truth in each which is determined entirely by circumstances.

The question is "when" should a change of seed be made. There is no doubt that considerable loss may sometimes result from using seed from a given crop when such crop is poor or otherwise unsuitable.

Generally speaking, a change of seed should be made only in the following cases:—

(a) When seed of better and more serviceable sorts than those now being used are available.—This can only be determined by carefully testing other sorts which seem to promise better than those now being cultivated. In the meantime, the old sort should be continued until absolute proof is obtained as to the relative standing of the new introduction. It may happen that changed conditions on a farm may make a change of sort desirable.

(b) When a sort has become mixed with other sorts.—The desirability of using pure sorts has already been pointed out (See page 10).

(c) When the crop becomes seriously damaged by reason of unfavorable weather or other agencies.—The danger of using seed which is not perfectly developed and which has been harvested badly has already been referred to. It may happen, however, that seed of fair quality may be obtained from a crop which is partially damaged, but in no case should seed be used until it has been tested for germination and growing energy.

(d) When seed has been damaged by threshing or by defective storing methods.

(e) When suitable machinery is not available for cleaning seed properly.—From what we have already said regarding the superiority of uniform and plump seed, the necessity of thoroughly cleaning all grain intended for seeding purposes is obvious. All seed should be run through a good fanning mill at least three times. If this cannot be done, it is advisable to procure seed of suitable quality and purity elsewhere.

REGARDING DEGENERATION IN POTATOES, AND CHANGE OF SEED TUBERS.

The degeneration which is often noticed in potatoes is not regarded by our best authorities as due to any natural or inevitable "running out" of the sort, but rather to "the effects of certain conditions which weaken the vigor and invite disease." Potatoes seem to reach their highest state of development under cool moist conditions, seed tubers produced under such conditions usually giving better results than those grown in hotter and drier regions.* Where potato growing is prosecuted in these latter districts, it would seem desirable to obtain seed frequently from districts which allow the maximum development of vigor. Where this practice is not followed, the vigor may gradually become weakened, resulting in a corresponding depreciation in yield and quality. Similar results in any case may follow neglect to discriminate between small, poorly developed tubers and those which are well developed and sound. Too often all the good sound tubers are sold or used for cooking while the poor, discarded and in many cases diseased tubers are kept for planting. Where this practice is followed there is bound to be a falling off in productiveness. The evidence at present available goes to show that *where suitable sorts are used and where suitable tubers of these sorts are utilized for seeding purposes each year, the standard of a variety may be maintained indefinitely under all favorable conditions of soil and climate.* Since some varieties are not adapted to certain conditions it is quite possible that their power to resist disease may become gradually reduced. This would

*See p. 73, Fourth Annual Report, Canadian Seed Growers' Association, for confirmatory evidence by Mr. W. T. Macoun, C. E. Farm, Ottawa, Ontario.

seem to explain why certain varieties grown in comparison with others and under similar conditions for a number of years seem to be more susceptible to blight and other diseases than do neighboring sorts. Obviously, the first consideration is *maintenance of vigor and control of disease* and this implies very careful selection of seed tubers, careful cultivation, spraying and rotation of crops.

The problem of potato improvement by the selection of favorable fluctuations or variations is intimately linked with that of "degeneration." That potatoes degenerate or "run out" naturally no matter where they may be grown, is an idea commonly held by the great mass of growers. Many believe that this is a natural phenomenon—something to be expected and something which cannot possibly be avoided. A new variety comes into circulation, remains in the foremost ranks for a few years or until it reaches a period of old age or "senility" and then gradually declines. Such is the generally accepted idea of the life of a potato sort. That certain varieties do appear to act in this peculiar manner cannot be denied. On the other hand, experience shows that other sorts which have been under cultivation a great many years do not appear to have lost in vigor or productive qualities during this long space of time. A good example is afforded in the Swedish sort known as "Dala" which is commonly grown in the Province of Delecarlia (Dalarne). This potato is said to have been introduced about 150 years ago, yet is one of the best sorts now grown in that Province.

PRINCIPLES OF PLANT IMPROVEMENT.

When single plants of the self-fertilizing class (wheat, oats, barley, peas, etc.) are propagated separately in small isolated cultures (so-called pedigree cultures) they breed relatively true from generation to generation providing, of course, they are not the product of a recent crossing but are constant (homozygous) in character. This fact, together with the discovery of the composite character of many of our old varieties has caused most specialists at breeding stations to adopt a system whereby the constituents of these old varieties may be isolated and tested in large numbers "separately." By a process of elimination, based on yielding tests and careful studies of each culture, both in the field and in the laboratory, the number is gradually reduced until only the best remains. Further progress is then usually sought by combining the desirable characters of the best strains by means of "hybridization."

System of Seed Selection for the Farmer.—While the above system is eminently suited to Experimental Stations where time and money are specially allowed for such work, yet the old system of "mass-selection" may still be regarded as the most practicable one by which the average farmer may annually obtain good seed on his own farm. This system will be outlined in detail later. By means of this method of selection a degree of "purity" may be maintained in large seed cultures which is scarcely possible in any other way. This in itself is sufficient to justify the application of the system. If applid to cross-fertilizing crops such as corn, clover, and roots, this method is full of promise of great gains, as in this case it may actually produce a "cumulative" effect; if applied to varieties of self-fertilizing crops which have become mixed, either through the accidental introduction of foreign

sorts or through other causes, it provides a means of effecting improvements "by separating out the inferior strains and effecting an inclusion of the best."

Since selection, be it "pedigree" selection or "mass" selection, according to most modern authorities, does not "produce" anything new but simply separates out that which already exists, its value after a certain point has been reached would, in the case of self-fertilizing plants, appear negligible. In so far as being able to effect any "accumulation" of hereditary variations is concerned, this may be quite true. On the other hand, there are certain physiological factors or agencies such as soil, climate, food and moisture supply which play an exceedingly important part in the growing of crops and which merit the utmost attention. These factors cause what are known as "fluctuating" variations, that is variations caused by environment and which, according to most modern breeders, are not hereditary. The selection of favorable fluctuating variations may not lead therefore, to any improvement in the race as such but there is abundant evidence to show that the superiority of the seed from such variations—from plants which have attained the most perfect development and maturity—manifests itself in better crops for one generation at least. In other words, modifications produced by "nurture" may not be hereditary but may be "re-impressed" on each generation by providing the proper cultural conditions.

The seed may be regarded as an unborn plant drawing its nourishment from the mother. If the mother is poorly nourished, the embryonic plant—the seed—is poorly developed. This is a simple case of malnutrition. Experience goes to show that such seed always produces plants of inferior development. This principle is exemplified in the runt of the swine litter. Such an individual, as is well known, seldom recovers that which has been withheld from it during the incubation or pre-natal period.

Importance of Continued Mass-Selection.— While seed from inferior fluctuations—from poorly developed and immature plants—may often be quite effectively excluded by the severe screening and grading of the bulk sample, yet it is considered a better and safer practice to select desirable plants in the first place, in order that the said sample may contain as little poor seed as possible. This fact, together with the fact that purity in a variety may be most effectively maintained from year to year by the annual "inclusion" or selection of a sufficient quantity of typical heads, panicles or pods to sow a small plot the following year as a base of supply, renders the system of mass selection exceedingly useful and one which every farmer who grows his own seed, should include as a part of his regular system of farm management.

Importance of high Cultural Conditions for Seed Growing.—In view of the importance of obtaining seed from plants which are perfectly developed and matured, the aim of the grower should be to provide such physical conditions in both the surface and subsoil of his land as will enable the plant to attain maximum development.

This fact suggests at once the desirability of every farmer setting aside his best patch of land each year as a seed producing plot and that he allow the crop produced thereon to "mature perfectly before harvesting." Another

practice, and one which every farmer may follow to advantage, is to locate, or mark off, the best patch or patches in his fields before harvesting, and allow these to stand until thoroughly mature. They may then be harvested and threshed separately, the seed being kept apart for the following year's seeding. A still better practice, however, is that followed by members of the "Canadian Seed Growers' Association" and which is described in detail in the following pages of this publication.

PART II.

THE CANADIAN SEED GROWERS' ASSOCIATION AND ITS WORK.

Original and Chief Aim of the C. S. G. A.—This Association is an outgrowth of what was known as "The Macdonald Seed Grain Competition," a competition in seed growing which began in 1900 and which continued for three years, extending over the entire Dominion and including, in all, about 1,500 competitors. The object of this competition was to stimulate an interest in the production and selection of high class seed by providing visible demonstrations as to the practical advantages which may accrue from the use of such seed. At the close of the competition, the Macdonald Robertson Seed Growers' Association was organized with a view to promoting, through organized effort, a continued interest in this question. The name of this Association was changed in 1904 to "The Canadian Seed Growers' Association," which name it still holds.

The Association seeks to attain its object by enlisting as members, farmers who desire to make a specialty of producing on their own farms, high class seed of one or more kinds of crop under quality which in turn is mul- is created a base of supply of pure seed of high quality which in turn is multiplied under the Association's inspection and control and made available for seeding purposes to the general farming public. This class of seed is known as "Registered Seed."

Organization.—The officers of the Association consisi of a President, three Vice-Presidents, a Secretary-Treasurer, an Executive Council and a Board of Directors consisting of twenty members. The Directors are elected annually from the different Provinces in Canada so that the Association is really an interprovincial body rather than a Federal one as that term is usually understood.

Membership.—The membership consists of Honorary and Active members. Any person in Canada of good repute, is eligible for membership as an active member providing he conforms to the by-laws and regulations of the Association.

Before being elected an active member in full standing, the Association requires that each applicant make a hand-selection of seed in sufficient quantity to enable him to sow a Hand-selected Seed Plot of the required size, the following year. It also requires wherever practicable, that his work be inspected and commended by an officer approved by the Association. *

Fees.—No membership fee is at present required. Neither is there any financial obligation incurred by any member until he actually has seed inspected and sealed in sacks. At this time a small inspection fee is charged. (See page 42.)

Applications for admittance should be addressed to the *Secretary Canadian Seed Growers' Association, Canadian Building, Ottawa Canada.*

*In the case of regularly organized "Seed Centres" the term "applicant" refers to the Centre and not to any individual member thereof.

The Work of the C. S. G. A. and its relation to that of the Federal and Provincial Governments.—The work of the Association may be said to be an *extension* of that Department of the Government service conducted by the Experimental Farms, Agricultural Colleges and by the Dominion Seed Branch. The Experimental Farms conduct work in original research with field crops, test different varities obtained from different parts of the world and endeavor to evolve, through a process of breeding and selection superior strains for use on Canadian farms. They are not, however, in a position to control the multiplication and distribution of these sorts in a large way and to best advantage among individual farmers. This important work can best be done by a separate and independent organization for obvious reasons. Were seeds of superior strains distributed direct to growers without the exercise of any control over its succeeding progeny, the greater part would quickly lose its identity and eventually be either ruined by lack of proper care in maintaining purity or completely lost. The conservation of all that is good and useful in improved stocks, together with their judicious multiplication and distribution on an extensive scale and under efficient control is therefore one of the main functions of the Association.

In view of the fact that each Province has a considerable financial interest at stake, and that it has special facilities for advancing and supervising this sort of work, the Directors have agreed that each Province, or its District Representatives, should assume responsibility for the initiation and general supervision of the work of growing Registered Seed, including the inspection of fields, within its borders.

The records, as in the case of Live Stock on the other hand, are kept at Ottawa, which place has been chosen as the headquarters of this interprovincial organization. By this arrangement the necessity of each Province having to keep its own registry office is obviated, while at the same time the whole organization is given a national status. This is particularly desirable wherever there is interprovincial or international trade.

While the field inspection is made by Provincial officers, the final inspection of seed in sacks offered for sale is made by officers appointed at, and under direct supervision of the head office.

The above arrangement provides an excellent scheme for co-operation between each of the Provinces and the Association as a whole, the Province being responsible for securing growers, and for the inspection of their growing crops, the Association assuming responsibility for keeping the records, for issuing certificates of Registration, for printing and distributing throughout all parts of Canada a Seed Catalogue, and lastly, for making the final inspection of seed in sacks and sealing the latter if satisfactory.

Funds.—Although this important public service is executed by a voluntary organization outside of the Government,yet on account of the value of such work to the country as a whole, together with the service which it is possible for such an organization to render in preventing the dissipation of improved stocks produced by experts, financial assistance is granted annually by the Dominion Government.

GENERAL SYSTEM OF SEED GROWING ADOPTED BY THE ASSOCIATION.

Choice of Variety.

The new beginner whose ultimate aim is to produce Registered Seed year after year must consider, first of all, what variety is likely to be most profitable to grow in his locality. (See p. 5 re various points to consider in making this choice.) The name of the variety chosen must then be approved by the committee appointed by the Association to determine what varieties shall be accepted for registration.* This Committee consists of the Superintendents of Experimental Stations, the Cerealist and Horticulturist at the Central Experimental Farm and at each of the Agricultural Colleges in Canada, the District Representatives of the Dominion Seed Branch and the Secretary of the Association, who acts as chairman. This arrangement implies that all new varieties must be thoroughly tested and must prove their superiority to the satisfaction of the Committee before being accepted for registration in the records of the Association.

Securing the Foundation Stock.

Having decided upon the variety the grower should next procure a quan-

Photo by C. E. Saunders.

Plots of grain at the Experimental Farm, Ottawa.
Test plots in background; Multiplying plots in foreground.
From this place the Association obtains much of its best foundation stock.

*See Eight Annual Report (1911-12) of the C.S.G.A., page 54 re action taken by the Association to limit the number of varieties accepted for registration.

tity of "Elite Stock Seed" or First Generation "Registered Seed" of this variety as foundation stock. (See p. 45 for definition of terms). This may sometimes be had directly from an Experimental Station and sometimes from another member of the Association. This seed in most cases should be treated so as to prevent the development of disease, should be sown by itself on specially clean land and every precaution should be taken to keep it pure. (See p. 32 regarding methods of maintainiing purity in seed.)

In the case of cereal grains the new beginner will usually have to content himself with "First Generation Registered Seed" rather than with "Elite Stock Seed" as foundation stock, since the latter class of seed is produced in relatively small quantities and consequently is not often available. This class of seed, however, is quite suitable for the above purpose. In the case of corn and grass seed on the other hand, "Elite Stock Seed" should always be insisted on.

Status of the First Year's Crop.

The general crop produced by a new beginner from the first year's sowing cannot be recognized as Registered seed owing to a technicality. (See p. 38 for further amplification.) It can, however, be used for the second year's seeding, and should the grower have qualified for membership the first year by making a hand selection of heads or tubers, as the case may be, for a hand-selected seed plot and have been admitted as a member of the Association, the seed produced from this second year's crop may be accepted for registration provided, of course, that the quality, purity and vitality are up to standard.

Production of Elite Stock Seed.

Having secured "Registered Seed" as foundation stock, the grower should plan to operate so that the succeeding crops may also be entitled to registration. Since no seed can be accepted for registration which is more than three generations descended from Elite Stock seed, and since first generation seed is most in demand, a supply of Elite Stock seed should be produced each year.

Elite Stock Seed is therefore the basis or starting point of Registered Seed. From it Registered Seed is produced. It represents the highest degree of perfection in seed and consequently special care is required in its production. It is defined (See p. 45 under "Definition of Terms" for fuller definition) as seed which is pure as to variety and which is suitable for multiplication and distribution. It is produced usually in limited quantities. When produced by a member of the Association, the area bearing it is known as a "Hand Selected Seed Plot." The seed which is used to sow this plot is obtained from heads, ears, pods, or tubers, as the case may be, which are selected by hand from a mature crop. This selection in the case of the new beginner, is made from his foundation field; in the case of the regular member, the selection should usually be made from a regular Hand-Selected seed plot.

The details of the methods of producing Elite Stock Seed differ somewhat according to the class of plant worked with. Thus four main classes

of agricultural plants, as regards methods of reproduction, may be distinguished as follows:—

(a) Those in which the seed is normally produced by the "self-fertilization" of the flower; e.g. wheat, oats, barley, peas and beans.

(b) Those in which "natural cross-fertilization" between individual plants is the common rule; e.g. corn, rye, and most grasses.

(c) Those in which "cross-fertilization between different individuals is obligatory"; e.g. Red Clover.

(c) Those which are reproduced in a "vegetative way"; e.g. the potato.

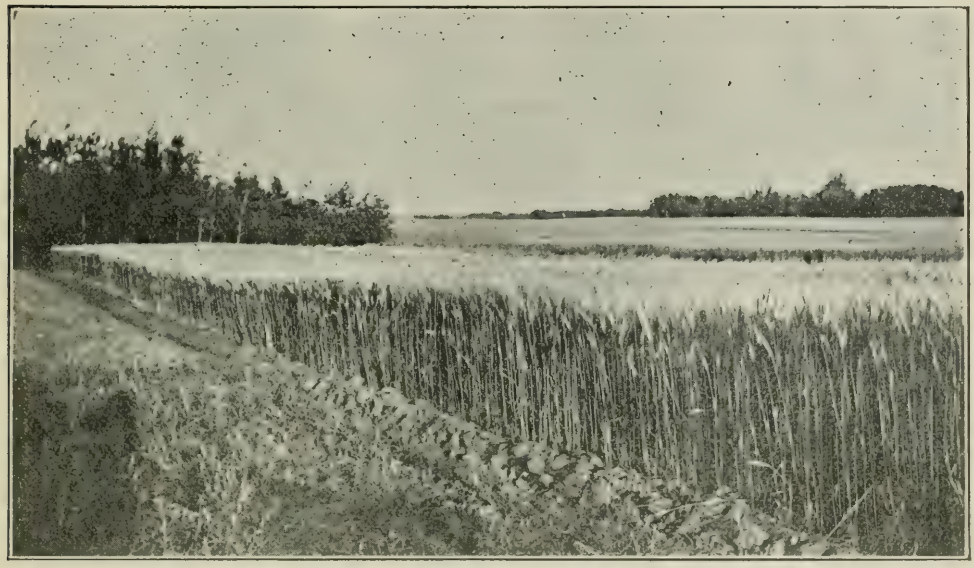
It will be necessary to deal with the process of producing Elite Stock in the case of each class of plant separately.

PROCESS OF PRODUCING "ELITE STOCK SEED" IN THE CASE OF SELF-FERTILIZING PLANTS, SUCH AS WHEAT, OATS, BARLEY AND PEAS.

As already pointed out (See p. 11 under "Principles of Plant Improvement,") plants such as wheat, oats and barley, which are self-fertilized, ordinarily breed true and seldom show any hereditary variations by means of which an improvement over the old race may be effected. Thus a strain (pure line) of oats, or wheat or barley developed from a single plant is found to remain practically constant in type from generation to generation providing natural crossing, which even in these crops may occasionally take place, does not occur. Modifications in the character of a plant due to such external factors as a superabundance of food, air, light or moisture of course are quite common but as it is not generally believed that these are reproduced, they need not be considered seriously in connection with any system aiming to effect permanent improvements.

Selecting Heads.—Since all applicants for membership in the Association are strongly urged to start with a *pure line* or strain rather than with a *composite* variety, that is a variety which contains two or more strains, and since such pure lines are now usually available, the process of producing Elite Stock Seed shall apply chiefly to pure strains. This process, owing to the relative stability of these strains, is quite a simple one, as it resolves itself chiefly into *the maintaining of purity.* This object may often be attained quite effectively by simply 'rogueing' the field, that is removing by hand all heads of plants which do not appear to belong to the variety under consideration. Since, however, one can never be absolutely sure that he has removed *all* impurities, the Association requires each member to make 'positive' selections that is to select typical heads in sufficient quantity (30 to 35 pounds) to give

him enough clean and absolutely pure seed to sow *at least* a quarter (¼) acre Hand-selected seed plot the following year. The general product of this seed plot may be ranked as "Elite Stock Seed."



"Hand-selected Seed Plot" of wheat in foreground producing Elite Stock Seed; Multiplying Field in background sown with Elite Stock Seed and producing first generation "Registered Seed."

The selection of heads may be made either from the standing plants or from the sheaf. While one can usually select finer looking heads from standing plants, this method has not always been found the most practicable, especially if one is looking only for typical and well developed heads. Selections of heads of the above sort from sheaves may be made more rapidly and quite satisfactorily. Such heads are also likely to be better 'filled' than are heads selected and separated from the straw in the field before the plant is properly 'cured.' This applies particularly to selections made from crops grown in the interior of the country rather from those produced in a Maritime District.

Where the member is not devoting more than say 20 or 30 acres to the production of Registered Seed of a given variety, it will usually pay him to produce enough Elite Stock Seed each year, to sow the entire area the following year. By this arrangement all the seed he may offer for sale will be "First-Generation Registered Seed," the grade or class which is most in demand. He will also be spared the trouble of keeping seed of different generations separate. (Seed which is one generation, two generations or three generations descended from Elite Stock seed may be recorded as "Registered Seed." (See p. 45, clause 5.)

Selecting heads (about 25 pounds) of O. A. C. No. 21 barley from standing plants. These are threshed and cleaned by hand and the seed used to sow the "Hand-Selected Seed Plot" the following year.

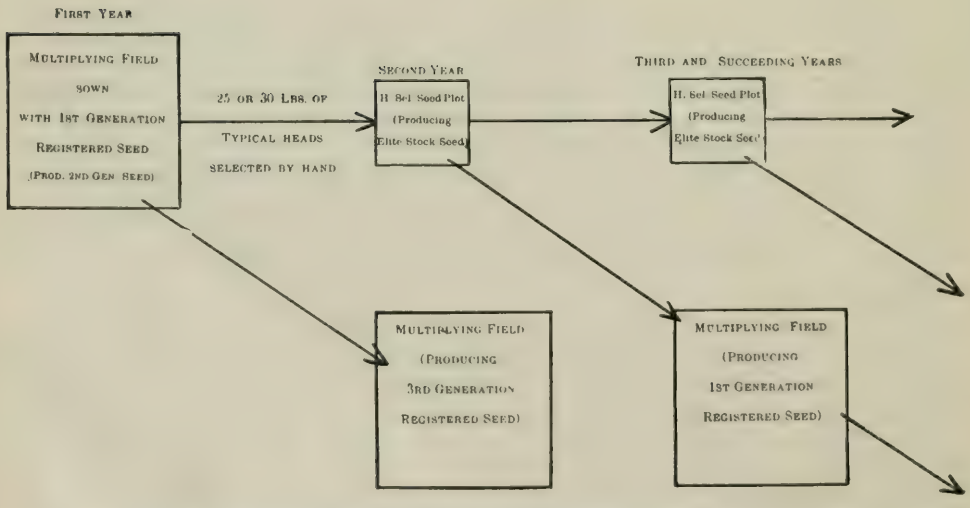


DIAGRAM SHOWING SYSTEM OF OBTAINING AND PROPAGATING "ELITE STOCK SEED" OF CEREALS.

The points of chief importance in connection with the production of Elite Stock Seed of self-fertilizing plants may be summarized as follows:—

1. The seed plot should not be less than *one-quarter of an acre in size*, and should be fertile, in a state of good cultivation, free from weed seeds and sown at the regular rate of seeding and in the proper place in the rotation.

2. At least twenty-five or thirty pounds of heads, panicles or pods, which are *uniform in character* should be selected by hand either from the standing crop on this plot *when perfectly matured* or from the sheaves before threshing.

3. The selected heads or panicles should be threshed by hand and the seed carefully cleaned by hand so that a pure uniform sample will be available for sowing the next year's seed plot.

4. The general crop on the seed plot which is known as "Elite Stock Seed", should be allowed to mature perfectly before harvesting.

5. All impurities should be removed from the above plot before it is harvested. This is a matter which should never be disregarded.

PROCESS OF PROCURING "ELITE STOCK SEED" IN THE CASE OF CORN.

(Representing Plants Which Naturally Cross-fertilize.)

The degree of stability which obtains in the self-fertilizing cereals is not found in the case of open-pollinated plants such as corn. Here natural crossing between different strains within the variety as well as between different varieties in adjoining fields is exceedingly common, with the result that true hereditary variations in the form of "new combinations of characters" are frequently effected. The fittest of these combinations should be conserved by selection. In selecting for specific qualities, such as earliness, nature assists greatly since the stronger, more perfectly developed and matured strains (combinations) may be revealed by the exigencies of soil and season, as will also those strains which are less suited to survive. A natural acclimitization consequently takes place which may be assisted materially by further elimination and selection by man. This applies particularly to those cases in which the aim is to produce earlier sorts.

The operation of a Hand-selected Seed plot in the case of corn each year, therefore, offers abundant opportunities, both for effecting actual improvements, as well as for facilitating the perpetuation of a supply of Elite Stock Seed. The following considerations should be closely observed in the operation of this plot:—

1. The plot should be isolated from other varieties in order to prevent cross fertilization.—Unless otherwise protected, a distance of approximately one-quarter of a mile should be allowed between different sorts, if possible, as the pollen is known to carry this distance in the wind. Where buildings, wood-lots or some other barrier providing a measure of protection intervenes, the above distance is not so necessary. A field of the same variety as that planted on the plot, and situated between the latter and another variety, provides a fair measure of protection against inoculation by foreign pollen.

2. The Plot should consist of not less than twenty rows with fifty hills per row. Both rows and hills should be at least 3½ feet apart. Plant each hill with four or five kernels and subsequently thin the young plants, when two or three inches high, to three plants per hill.

3. Each row in the above plot should be planted with corn from a single ear.—The ears required to plant this plot should be as nearly alike as possible in regard to the following particulars, viz.:—shape, length, circumference, covering of butts and tips, shape of kernels, number of rows of kernels on each ear, percentage of corn to cob and color of cobs.

A desirable ear of dent corn for Canada may be described as follows:—

(a) Generally cylindrical in shape with good full middle.

(b) From 7¾ to 9½" long, depending on the variety.

(c) From 6½ to 7½" in circumference, depending on the variety.

(d) Well covered at the tip.

(e) Smooth and well rounded at the butt.

(f) With no more than 20 rows of kernels.

(g) Kernels broad, flat and wedge-shaped (not shoe-pegged or blocky).

(h) The rows of kernels straight and unbroken.

A desirable ear of flint corn may be described as follows:—

(a) Generally cylindrical in shape.

(b) No limit as to size.

(c) Well covered at tip.

(d) Smooth and even at butt.

(e) Kernels flatly oval.

(f) Rows of kernels straight and unbroken.

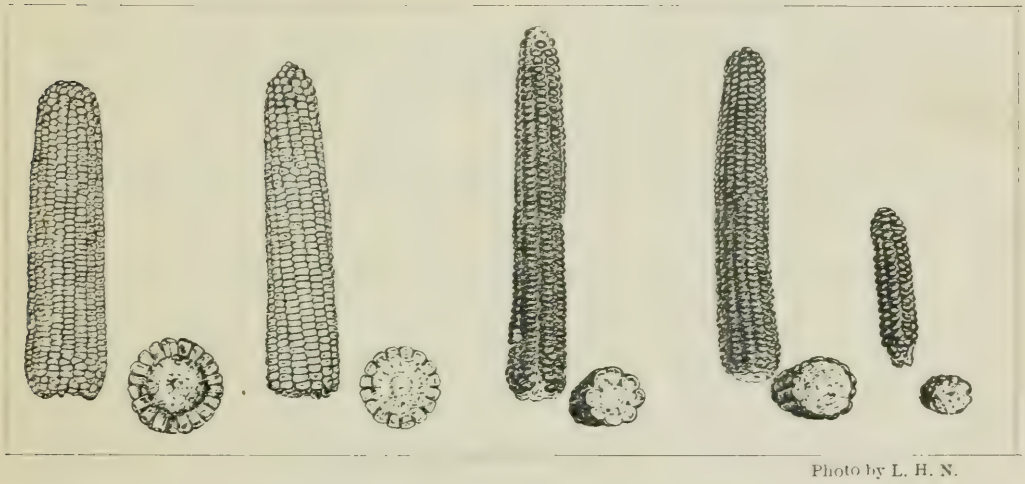


Photo by L. H. N.

Types of corn from different latitudes in Canada The further north corn is grown the shorter and smaller become both ear and kernel.

It is well to record quite minute details as to the peculiarities or characteristics of each ear planted in the special plot. The recording of such details necessitates a careful examination of each ear and assists in eliminating the danger of planting ears of different types. For this purpose special blank forms are supplied each grower in early spring.

4. Test Each Ear for Vitality.—This is important, since a stand as nearly perfect as possible is desirable in order that conditions may be uniform throughout the plot. Where the stand is uneven, certain plants may receive an advantage over others and consequently produce ears which are abnormal. Such ears, when met with, should not be selected for planting on the seed plot of the following year.

5. All undesirable plants in the plot should be detasseled. — The tassels, (male organs) which are situated at the top of the stock, produce the pollen which falls on the silks of the ear and effects a fertilization of the ovaries. This is followed by the development of the kernel. Where pollen from a strain which produces a large proportion of barren plants, or plants which are inferior in other regards, falls on the silks of a good strain, the resulting kernels may combine the characters of the good with the bad. In order that only strong, vigorous, productive strains may be concerned in the parentage of seed ears, the tassels should be removed from all inferior plants in the plot. This should be done as soon as these organs appear and before the pollen has been shed; otherwise this operation will be without value.

The selection of seed ears for next year's breeding plot should be made as follows:—

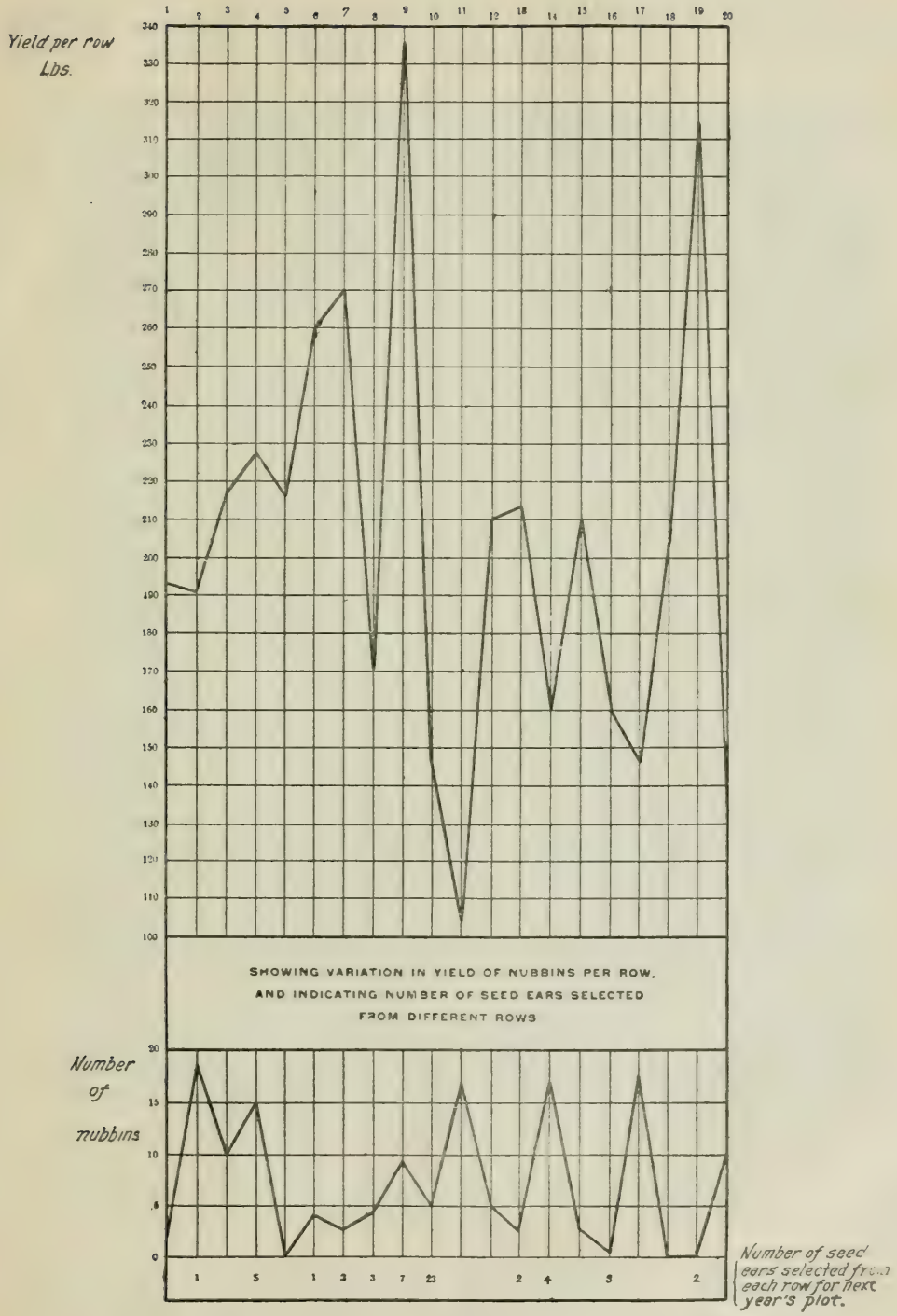
(a) Ascertain and mark a few of the best rows in the plot. This choice of rows should be based upon such characters as vigor and productiveness with special reference to the absence of barren plants and of plants producing nubbins on the row as a whole.

(b) Fifty or more of the best ears, and which approximate most closely the desired type, should be chosen from the best plants in the best rows. The 20 ears actually required to plant next year's plot should finally be chosen, after careful examination, from among the 50 first selected.

(c) These ears should be thoroughly dried before danger of freezing and subsequently stored in a dry, airy place and carefully protected against mice, squirrels and other vermin.

Ear Remnant System of Corn Improvement.—This system which is in common use in certain parts of the United States, differs somewhat from the system just described. It is rather more complicated, but is highly recommended where the grower is prepared to devote the time necessary for its proper execution. By this system only a part of each ear is planted the first year, the remainder being retained until its value is determined by the part planted. The "remnants" of the four or five ears which have given the best results are then planted separately the following year in short rows, the corn from the best ear remnant being used to plant every alternate row. All other rows are then detasseled as the tassels appear so that the rows planted with corn from the above "best" ear becomes the "sire" of the patch. All desirable ears produced on this patch may be bulked together and used to plant a "multiplying plot" the following year, this plot being well isolated from all other corn.

In seeking still further to improve the variety, the above process must be repeated continually as it must not be assumed that the end has been reached when the best ear, out of the first 25 ears selected has been located. Ears must therefore be selected each year not only from the general crop but from the breeding plot and from the multiplying field as well and parts of these ears planted side by side in the ear-to-the-row test-plot, as above described.


Yield per row
Lbs.
SHOWING VARIATION IN YIELD OF NUBBINS PER ROW,
AND INDICATING NUMBER OF SEED EARS SELECTED
FROM DIFFERENT ROWS
Number
of
nubbins
Number of seed ears selected from each row for next year's plot.

Results obtained on a seed corn plot by a member of the Association.

PROCESS OF PROCURING "ELITE STOCK SEED" (TUBERS) IN THE CASE OF THE POTATO.

(*Vegetatively Propagated Plants*).

The potato tuber is simply a specialized part of the underground root stem which is stored with starch and covered with buds which are commonly called "eyes". When the tuber or a portion thereof is planted under favorable conditions, the buds begin to grow, the plant food being at first drawn from the tuber itself but eventually from the soil.

While the peculiarities of the mother plant are ordinarily reproduced by means of tubers without any apparent deviation, yet variations occasionally occur. These are believed to arise either as a result of disease which attacks certain plants and spares others or as a result of some sudden change in the "life" of the tuber itself. Experience seems to show that both agencies are active in inducing "tuber variation."

As in the case of corn, therefore, the "Hand-selected Seed Plot" of potatoes serves two purposes, viz.:—First, it provides the grower with an opportunity of actually "improving" upon the variety "by the continuous selection of specially desirable hills," and secondly, it provides him with a source of "Elite Stock Seed" each year.

Foundation Stock.—The grower undertaking to produce Elite Stock Seed should be exceedingly careful to start only with seed which is as nearly perfect as possible. Seed potatoes must not only be true to variety but above all must be free from disease.* Foundation stock of this sort should therefore be insisted upon by new beginners. This seed should then be planted on well prepared soil that has never been known to produce a diseased crop of potatoes. The details connected with the multiplication of Elite Stock Seed and the handling of the product (Registered Seed) are discussed later. (See page 32.) The details of the system by which Elite Stock Seed may be produced are as follows:—

Assuming that the grower has secured and planted a quantity of Elite Stock Seed or of First Generation Registered seed potatoes of a given variety as his foundation stock, he should proceed as follows:—

The First Year's Operations. 1.—During the growing season go over the crop carefully and remove all hills which show evidence of disease. This should always be done in the case of all potato fields grown for seed.

2. When harvesting the potatoes on the mother plot or field dig at least 100 hills by hand keeping each hill separate. Then pick out a number of the best hills for planting the Hand-Selected-Seed Plot next year. The product of this Plot may in due course be accepted as "Elite Stock Seed".

*The national importance of this point to the whole potato industry in Canada is clearly pointed out by Mr. H. T. Gussow, Experimental Farm, Ottawa, in an article entitled "Potato Diseases and the position of the Canadian Seed Growers' Association," Tenth Annual Report of the C.S.G.A., page 81.

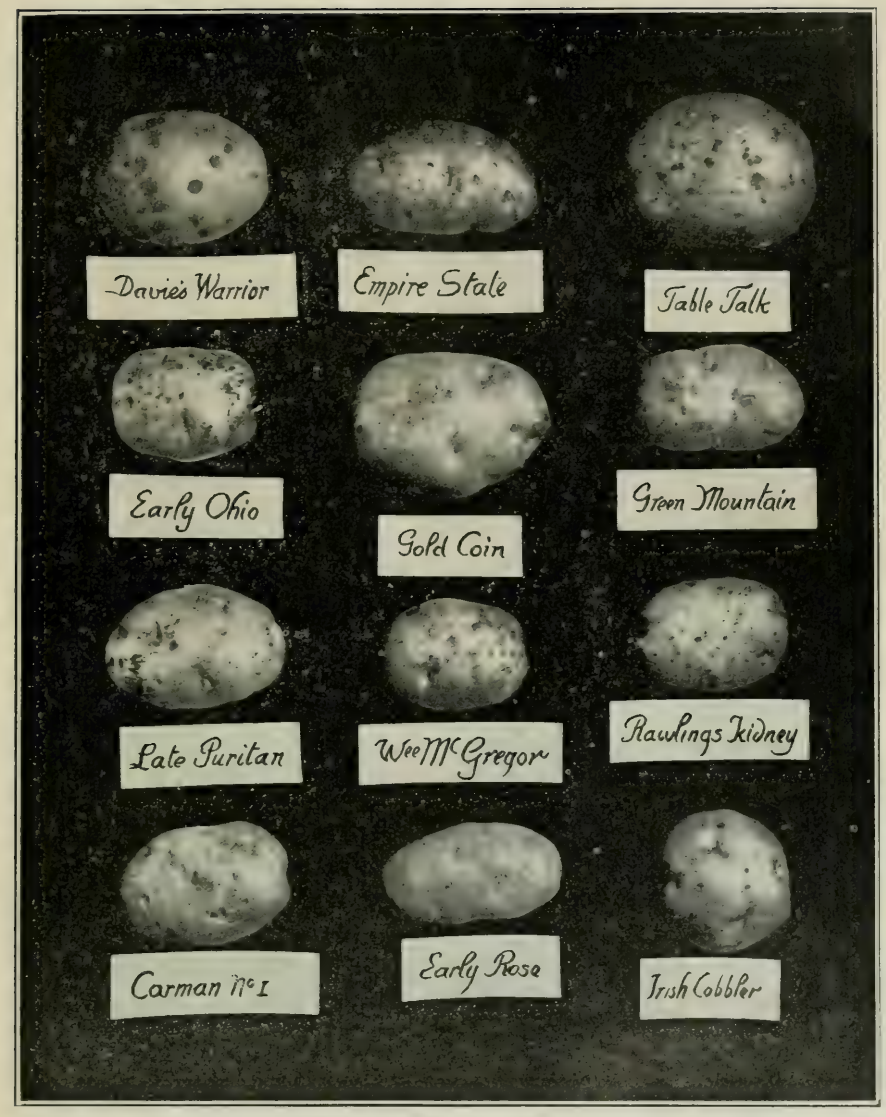


Photo by F. T. Shutt.

Twelve of the most productive varieties of potatoes in Canada.
(Note presence of common Scab on some of these tubers. This is something to be guarded against.)

The actual number of hills selected will depend largely upon the system it is intended to follow in their propagation. Thus these hills may either be (a) bulked together and used to plant the Hand-Selected-Seed-Plot the following year, or (b) they may be stored separately and planted separately on the Seed Plot in accordance with the hill-to-the-row system. For those who have the time, best results usually may be expected from the hill-to-the-row system at least for the first two or three years. Members are allowed to follow which ever system they prefer.

Method of Planting Selected Hills. — (a) *Bulking Method* : By this method the selected hills are simply bulked together and used to plant the Hand-Selected Seed Plot the following year in the ordinary way. A sufficient number of hills to make up about five (5) bushels should be selected. This amount after allowing for disease, should be sufficient to plant a seed plot of one-quarter acre.

(b) *Hill-to-the-Row Method.*—By this method the selected hills are ke separate over winter and are planted separately the following Spring, each selected hill planting a short row. In order that the productive qualities of each selected hill may be compared by means of the performance of its progeny, it is desirable that each of these rows have the same number of hills and be planted with the same total weight of Potatoes.

The rows may be planted parallel with each other or they may run in a continuous row, being placed end to end and separated by stakes. (See illustration).

Seed Plot of Potatoes Planted bythe Hill-to-the-row method.

By this method not nearly so many selected hills can be handled as is possible by the bulking method, since it is seldom found practicable to handle more than from 25 to 50 selected hills. By planting each selected hill in a

separate row, the grower is enabled to select the required number of superior hills for the following year's seed plot *from the best rows.* Herein lies the one advantage over the Bulking method.

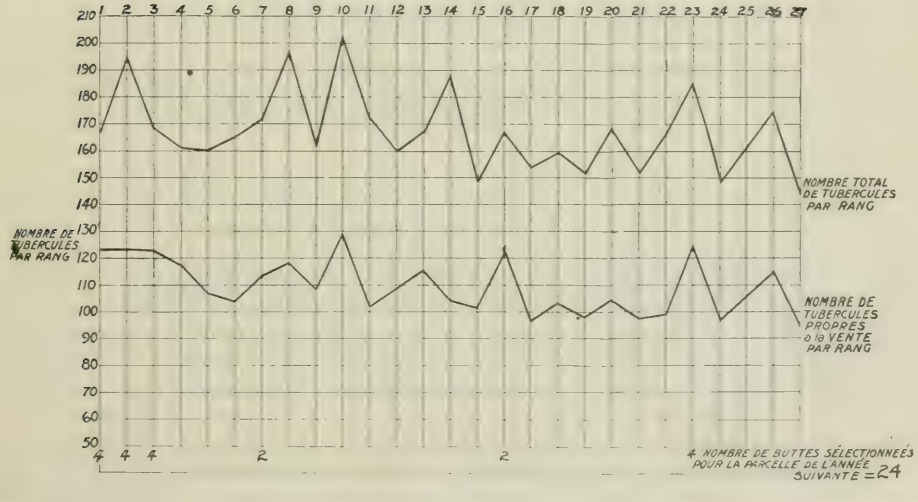
A Seed Plot composed of 25 rows, each planted with tubers from a single hill would occupy approximately one-thirty-fifth acres. After selecting 25 or 30 hills for the following year's seed plot there should remain ordinarily from 7 to 10 bushels of "Elite Stock Seed." This should be sufficient to plant a "Multiplying Field" of about half an acre, where 2 oz. pieces are used and planted 4" apart in drills which are 30" apart. Where a larger Multiplying Field is desired it is only necessary to increase the size of the seed plot.

DIAGRAM SHOWING VARIATION IN YIELD OF INDIVIDUAL ROWS (8 HILLS PER ROW OF POTATOES GROWN ON SPECIAL SEED PLOT IN 1913.

IRISH COBBLER.

(Grown near Duval, Sask., by W. E. Turner.)

ROWS.



Noet.—Grown on black loam that had been broken 5 years; had never been manured, but 1 quart of hen manure was sprinkled around each plant just as they were coming through the surface.

THE PRODUCTION OF ELITE STOCK SEED OF CLOVER AND ALFALFA.

In Red Clover, cross-fertilization is obligatory, that is, a flower of a given individual cannot be fertilized by its own pollen. The result of this is that every red clover seed is the result of cross-fertilization, thus rendering it impossible to produce absolutely pure strains. Experience has shown, however, that it is possible to attain a relatively high degree of purity and constancy in clover and also actually to improve upon a variety by weeding out the more delicate and less valuable strains, retaining only those fitted to survive. While Nature herself will often weed out many of the weaklings, especially when the winters are severe, yet man can do much to assist her by systematically eliminating apparently inferior or weak plants, keeping only those which are strongest and most vigorous and which possess the most desirable type.

In Alfalfa, cross-fertilization is not obligatory, but may rather be said to take place frequently. By reason of this fact, its improvement and propagation may be effected along essentially the same lines as those followed in the case of grasses. (See page 31.)

Actual improvement work with Red Clover and Alfalfa, especially when the production of hardier varieties is the chief consideration, is a work which may be carried on to advantage by individual farmers as well as by experts at Experimental Stations. Indeed, it is desirable that as many farmers as possible engage in this work, in order that "home-acclimatized" strains be available in every locality.

When breeding Clover and Alfalfa, the chief aim should be:—

(a) Greater hardiness, i.e. ability to withstand the conditions of winter and early spring.

(b) Greater yield of hay.

(c) Greater seed production.

The successful growing of high-class clover and alfalfa seed, that is, seed of a type known to be hardy and productive, and which is also of high quality and free from weeds, demands, as in other crops, a reliable and constant source of seed supply (Elite Stock Seed). Such a supply may be produced by the farmer himself. To this end the following course of procedure is recommended:—

1. Obtain a few pounds of seed (3 or 4 lbs. will be sufficient in most cases) as Foundation Stock from the most reliable source. This may often be procured in the neighborhood from some grower who has been growing his own seed for a number of years. In the case of Alfalfa, it may often be necessary to obtain a supply from some outside source. In this case, varieties such as "Grimm's" or "Ontario Variegated" should be taken into consideration. At present (1915) the former variety seems especially promising.*

*For the possibilities of breeding a hardy strain of Alfalfa from the common varieties see discussion by by Dr. M. O. Malte in 10th Annual Report of the C.S.G.A., page 45.

2. This seed should be sown on clean, well prepared land, either in the spring or later and with or without a nurse crop. The most satisfactory method, especially in the case of Alfalfa, is to sow without a nurse crop between June 15 and July 15, and in drills, the drills being from 24″ to 30″ apart. By this method of seeding weeds can be kept in check more easily while the seed is likely to "set" more abundantly.

3. The seed plot should be located as far as is convenient and practicable from all other fields producing the same kind, in order to ensure a measure of protection against crossing with inferior forms.

4. In the spring all weak and inferior looking plants should be pulled up and discarded, while during the growing season the plot should be very carefully 'rogued'.

5. When the plants are well matured, harvesting should take place. Whatever machine is used for this work, care should be taken to avoid waste of seed. (See p. 36 for suitable machiinery for harvesting.)

Where the foregoing directions are followed carefully, for two or three years the seed produced, if recommended for such recognition by an expert. may be accepted for registration as "Elite Stock Seed". The method of propagating and handling the product of this seed (Registered Seed) is given in detail later. (See page 35.)

THE PRODUCTION OF "ELITE STOCK SEED" OF GRASSES SUCH AS TIMOTHY, ORCHARD GRASS, Etc.

In almost all our grasses the flowers open before fertilization takes place with the result that the bulk of the seed produced is the outcome of cross-fertilization, although a grass plant, unlike Red Clover *can* be fertilized by its own pollen. Seed produced by cross-fertilization is likely to produce plants which are variable in character and in industrial worth. In producing Elite Stock Seed of grasses, the first aim therefore must be to isolate a pure and constant strain possessed of superior yielding power and quality for feeding purposes. This is a work which requires much skill and patience as well as time, and must be left chiefly to specialists. For this reason the details of the method of producing Elite Stock Seed of grasses is not dealt with here.* The *propagation* of Elite Stock Seed for Registration, however, may be carried on by the farmer quite easily. This phase of the work is described on page 35.

NOTE:—Persons interested in the production of seed for registration of crops not specified in this booklet e. g. Field Roots and Garden Vegetables, should communicate with the Secretary and obtain specific directions regarding method of procedure.

*For method of Grass-breeding see publication "Plant Breeding in Scandinavia," by L. H. Newman, Ottawa, pages 155-167. Price $1.00 at office of C.S.G.A.

THE MULTIPLICATION OF "ELITE STOCK SEED" OF CEREALS,.. POTATOES AND CORN.

Cultural Conditions for Seed Growing.—In the multiplication of "Elite Stock Seed" great care should be exercised in maintaining purity and in insuring a product of superior quality. This requires soil which is fertile, in good physical condition, properly drained, uniform in quality and free from weed seeds. In the case of potatoes these should not be grown on land which bore a diseased crop recently. These conditions are imperative where the grower intends to offer seed for sale. Uniformity of moisture content in the soil throughout the field is especially essential to the production of seed of uniform quality and maturity. Where the surface of the field is uneven, the depressions are almost sure to be moister and thus to cause later ripening. This is especially true in the absence of proper draining. These defects can often be remedied to a considerable extent by levelling. Such work may appear more or less impracticable, but experience has shown it to pay for itself quickly, not only in better quality of crop but in increased yields.*

The use of a suitable system of crop rotation is a matter of great importance in seed growing. Indeed, the successful seed grower must, of necessity, be one who is skilled in the cultivation of his soil and in arranging his crops in proper sequence. In Eastern Canada, the best quality of seed grain, grass and clover seed is usually obtained after a hoed crop, which crop leaves the soil well packed at a depth of four or five inches, yet loose on the surface. Where the soil is light and loose, it is very important that it be thoroughly packed before seeding. In the case of very light soils, it has been found good practice to roll twice before seeding and once after seeding, finishing off after the roller with a light harrow.*

In growing seed grain after summer fallow, as is commonly done in Western Canada, investigations to date seem to indicate that the principle of packing the soil firmly before seeding is quite as applicable as in other cases. The extent to which quality as well as quantity of seed is dependent upon soil conditions indicates that seed improvement and soil improvement must go hand in hand. The aim of the seed grower should therefore be to gradually "improve his land." Members of this Association are strongly urged to study with great care the question of soil cultivation and crop rotation. Their success as seed growers will depend quite as much, if indeed not more, upon a knowledge of the attributes of "Good Soil" as it will upon those of "Good Seed."†

Maintaining Purity.—The problem of maintaining purity in the progeny of "Elite Stock Seed" is an important and more or less arduous one. No matter how careful the grower may be, it is only through eternal vigilance

†Members are referred especially to the following articles by Mr. J. H. Grisdale, Director of Exeprimental Farms, Ottawa, in the Second and Eighth Annual Reports of the Seed Growers' Association respectively:—

1. "Some Common Principles which Underlie Improvement in Animals and Plants."
2. "Cultural Conditions for Seed Growing."

Those engaged in Potato growing are referred particularly to Bull. 49 (1910), by W. T. Macoun, Horticulturist, C.E. Farm, on "The Potato and its Culture."

*See address entitled, "Cultural Conditions for Seed Growing" by J. H. Grisdale, Eighth Annual Report, C.S.G. Association.

that weed growth and the introduction of foreign varieties may be kept in check. An important precaution which all members are urged to observe is not to grow more than *one variety* of wheat or oats, or barley on the same farm. Growers producing oats on a large scale for seeding purposes are also advised not to grow barley on the same farm, and vice versa, providing their system of farming will allow this. With the system of threshing and handling seed which prevails in most parts of Canada, it is very difficult to maintain adequate purity where the above precautions are not taken. Where the itinerant threshing machine is used by members, they are urged to see that it is properly cleaned before entering their premises.

A practice which the Association strongly recommends as a safeguard against the inclusion of impurities is to "rogue" their fields, that is remove all aberrant individuals by hand, before harvesting. A good plan, in the case of cereals, is to have someone preceed the binder and pluck out all foreign varieties which may be found within the width of the swath. This plan obviates the necessity of tramping the crop and is at the same time the easiest and most effective. To do this work thoroughly, it requires about two persons, each of whom may be held responsible for two sides of the field.

In the case of potatoes, all tubers produced by plants which deviate from the tubical variety characteristics, should be removed.

Allow the Cultures to mature Thoroughly. — The importance of allowing all seed cultures to mature thoroughly before harvesting has already been dealt with so need only be mentioned here. Should a part of the field be ripe while another part is still green, the latter should be allowed to stand until thoroughly matured, the former being harvested first.

The Cleaning and Grading of Seed. — The proper cleaning and grading of seed in order to produce a clean uniform sample of the best developed seed is one of the most important phases of the seed business. On page 8 of this publication, special reference is made to the double advantage of grading and screening oats so as to reduce the proportion of secondary and poorly developed primary kernels in the sample. It is but little less advantageous to effect similarly close separations in the case of all seed. The smaller and more poorly developed seed in the case of cereals, can always be used for feeding purposes with immensely greater profit than for seeding. Such a statement has already been sufficiently amplified in the preceding pages of this circular.

In order to separate the "Seed" from the "Feed," a good fanning mill is indispensible. Without such a mill no farmer can hope to become a successful seed-grain grower, unless he is able to have his seed cleaned by another who is better equipped to do the work. This mill has been justly regarded as the most important implement on the farm, yet it is astounding how lightly many farmers regard its use. Indeed, comparatively few farmers seem to have a clear idea as to 'how' it should be used, simply passing their seed through the mill once or twice in a perfunctory sort of way, trusting Providence to make up for any delinquencies on their part. If rightly used, this machine will pay for itself on any farm in one year. Let us illustrate this: Properly graded seed oats can very easily give 5 bushels per acre more than

seed which is not graded. The quality of the crop produced is also likely to be considerably better. On an area of ten acres this would mean an increase of 50 bushels, which, at the very moderate price of 55 cents per bushel, means a gain of $27.50, the average price of a good mill. There are many good fanning mills now on the market and agencies are to be found in most large towns and even villages. We submit herewith a list of some of these:—

Fanning Mill Firms. — "The Chatham Mill", manufactured by the Manson Campbell Company, Chatham, Ont.

"The Clipper Mill," manufactured by A. T. Ferrell & Co., Saginaw, W. S. Mich., U.S.A.

"The Perfection Mill," manufactured by The Templin Manufacturing Company, Fergus, Ont.

"The Perfection Grain and Seed Separator," manufactured by The Western Manufacturing Co., Ltd., Regina, Sask.

"The Tara Mill," manufactured by W. A. Gerolamy, Tara, Ont.

"The Monarch," manufactured by the Mississippi Iron Works, Almonte, Ont.

"The Winner Fanning Mill", manufactured by Tudhope Anderson Co., Lt'd., Orillia, Ont.

Most fanning mill firms publish excellent illustrated booklets explaining clearly how the different screens should be arranged to remove different impurities as well as all light, shrunken and poorly developed seed from the sample. These booklets are sent free of charge to anyone who applies for them and all growers are strongly urged to secure copies and to study them with care.

Since the size of seed differs in different varieties and in different soils and seasons, it is impossible to lay down any definite rules as to what screens should always be used. The grower must do a little experimenting each year on his own account in order to determine exactly how he may arrange his mill so as to effect the best separation. A half-hour devoted to testing different arrangements and different sieves will quickly be repaid in the quality of work done.

Where the grower has trouble in removing certain impurities such as barley in oats, he may send a small ounce sample to the firm whose mill he is using and have them advise him as to how to overcome the difficulty. The fact that each screen is plainly-numbered enables the firm to advise as to which to use. The above service is done free of charge.

In the case of potatoes no tubers weighing less than three ounces or more than six should be used for planting.

MULTIPLICATION OF ELITE STOCK SEED OF GRASSES, CLOVERS AND ALFAFA.

In the multiplication of Elite Stock Seed of Grasses, Clovers, and Alfalfa, the chief concern consists in maintaining the quality and purity. The importance of this should under no circumstances be underestimated.

The details of the system by which Elite Stock Seed of these plants may be propagated may be summarized briefly as follows:

1. **Source of Seed.**—Obtain seed of a quality and purity entitling it to the rank of "Elite Stock Seed". In the case of Clover and Alfalfa the farmer may produce this himself as already indicated (see p. 30), but in the case of the grasses he may have to procure his Elite Stock Seed from a specialist. Grasses and Alfalfa being perennials, that is, plants which continue to grow from the same root year after year, a plot sown with Elite Stock Seed may continue to produce first generation registered seed for propagation indefinitely. This renders in unnecessary to procure a fresh supply of Elite Stock Seed every year in the case of these plants. In the case of most grasses a satisfactory stand may be expected to continue for at least three or four years. In Alfalfa the stand may last even longer. Red Clover and Alsike on the other hand being essentially biennials, produce only one crop of seed from the same root. In the case of these plants it is practically necessary to obtain for propagation a supply of Elite Stock Seed each year, when the production of Registered Seed is the aim in view.

2. **Size of Field.** — A sufficient quantity of Elite Stock Seed should be secured to sow at least one-quarter of an acre of land, but a larger area might often be operated to the grower's advantage.

3. **Isolation of Field.**—In the case of grasses, the field in which Elite Stock Seed is sown should be at least 300 yards from any other field or area producing unimproved plants of the same species. In the case of Clovers and Alfalfa the multiplication field should be at least one-quarter of a mile away from any other area maturing unimproved plants of clover or alfalfa respectively. The exact distance required for the safe isolation of clover and alfalfa is difficult to determine, owing to the extent to which local conditions affect the situation.

4. **Seeding.**—The seed should be sown on specially clean and well prepared land. Seeding may take place either in the spring or later and with or without a nurse crop as conditions demand. The method which is coming to be more generally recommended where seed production is the chief consideration is to sow in drills and without a nurse crop. The drills should be from 24" to 30" apart. For seeding in drills the Plant Junior hand drill gives good satisfaction. By sowing in this way the land can be cultivated occasionally and the crop kept free from other grasses and noxious weeds. Experience also goes to show that a better stand may be expected by this method as may also a heavier seed production. Much less seed (approximately one third) is also required by this method than is necessary when sowing broadcast.

5. **Care During Growing Season.** — During the growing season, especially as the plants approach maturity, the field should be gone over carefully and all foreign plants, the seed of which might endanger the purity of

the commercial article, should be removed. Care should also be taken to prevent all plants of the same species found growing along the margins of the field or in fence corners from developing heads and thus endangering the purity of the improved stocks by cross-fertilization.

6. Harvesting, Curing and Threshing.—The methods of harvesting, curing and threshing in the case of grasses vary. Briefly speaking the ordinary grain binder is recommended for harvesting both grasses and clovers. In the case of the latter no twine is used. The spring is also slackened so as to allow the clover a free course to the ground. Clover so delivered does not shell readily, is well out of reach of the horses and machine and will be light, so that the wind and sun can easily dry and cure it. It is then drawn directly from the windrow to the barn. If a clover huller is not available clover may be threshed with the ordinary separator although this should be provided with a few attachments to prevent waste of seed and to encourage closer threshing.

For detailed information the reader is referred to the publication entitled "Fodder and Pasture Plants" (Clarke and Malte) available at the Publications Branch Department of Agriculture, Ottawa. Price, 50 cents.

Seed Centres.

As indicated in the Constitution of the Association (See clause 10) any group of persons, on becoming regularly organized, may be admitted to membership *as a group* and be given the same standing as an individual. This arrangement is designed to facilitate the multiplication of seed on a larger scale in that it permits any group so organized to choose one of its number to produce all the Elite Stock Seed required by the group. By this arrangement the other members of the group are simply *propagators* their Elite Stock seed or its immediate progeny being obtained regularly from the chosen grower. All seed produced by a group or "Centre" as above is required to be handled under the name of the Centre whose secretary must affix his signature to all registration tags attached to sacks of Registered seed sold.*

REGISTRATION OF SEED.

Certificates of Registration. — Seed of varieties which have been approved by the special committee appointed for the purpose and which has been grown and handled by members in accordance with the rules of the Association, may be registered in the records of the Association, and may receive special recognition in the form of Certificates of Registration. (See Section 31 of By-Laws and Regulations). Two classes of certificates are issued. The first is for "Elite Stock Seed" and the second for the succeeding progeny of such seed up to and including the third generation descended therefrom. All seed belonging to the latter category is designated "Registered Seed." (See Definition of Terms" p. 45 The certificate for "Elite Stock Seed" certifies that the said seed has been produced in accordance with

*Any group of persons desiring to organize themselves into a "Seed Centre" are advised to communicate with the Secretary of the Association for further information.

Grower's No. ..... *Certificate No.* .....

Canadian Seed Growers' Association

Registration Certificate

for

"Registered Seed"

Kind ..... *Variety* ..... *Quantity* .....

This is to Certify *that the above mentioned quantity of seed, of the variety indicated, has been produced by Mr.* ..... *in accordance with the rules of this Association, and that the said seed has been recorded by the Association as* **Registered Seed,** ..... *generations descended from* **Elite Stock Seed** *registered under Certificate Number* ..... *in the year 19.* .....

In witness whereof *the duly authorized officers of this Association have hereunto subscribed their names and caused the Seal of the Association to be hereto affixed at Ottawa, Ont., this* ..... *day of* ..... *A.D 19* .....

(SEAL)

..... *President.*

..... *Secretary and Treasurer.*

Form of Certificate of Registration used by the Association.

the regulations of the Association and indicates in each case the origin of the seed. The certificate for "Registered Seed" likewise certifies that the seed has been grown according to regulations and that it has been recorded as "Registered Seed" a certain number of generations descended from "Elite Stock Seed."

Status of Seed Produced by Applicants for Membership.—While records are kept by the Association of all seed intended for registration, and while full credit is given in the records for all work done by each applicant, yet no Certificates of Registration are issued for any seed grown by an applicant during his year of probation, i.e. the first year. If the applicant qualifies for membership in the Association and is elected a member at the end of his first year's work, any seed of any kind of crop produced or selected by him during the succeeding years, and which is otherwise eligible, will then be entitled to receive full recognition through Certificates of Registration.

Standards of Quality and Purity for Registered Seed adopted by the Association.—To be eligible for membership the applicant must have produced a quantity of Elite Stock Seed and must have shown that he takes the work seriously. No Registration Tags (Special tags attached to sacks of Registered seed as explained below) will be issued for any seed unless it be:—

(a) Pure as to variety and true to type.

(b) Free from seeds of other cultivated plants.

(c) Free from seeds of weeds coming within the meaning of the term "noxious weeds" as applied to the Seed Control Act and which are considered by the Executive to be of a dangerous character. (See below for list of "noxious weeds.")

(d) Free from, or containing not more than a total of one seed of other weeds of minor importance, such as wild buckwheat, lamb's quarters, foxtail, etc., per pound of cereals and other seeds of like size and not more than one per ounce of smaller seeds such as flax, grasses and clovers.

(e) Well matured, clean, sound, (smooth in the case of potatoes) plump, of good size and color and free from disease.

(f) Up to the percentage standard of vitality recognized for good seed of the kind under the Seed Control Act.

Explanation of Standards referred to in Clause (e).

"Well matured" seed means seed which does not contain more than 2% by number of immature seeds;

"Clean" seed means seed which is free from dirt and inert matter;

"Sound" seed in the case of cereals, means seed which is free from mustiness, frost injury, etc., and which does not contan more than 2% of

broken, sprouted or otherwise damaged kernels. In the case of potatoes, "sound seed" means tubers which are practically free from all kinds of internal or external discoloration and other blemishes;

"Plump" seed means seed which is well developed and which does not contain more than 2% by number of shrunken kernels;

"Smooth" seed applies exclusively to potatoes, and implies that the tubers are free or practically free from protubrances (second growth) or other malformations.

The "size" of seed applies more particularly to potatoes. To be suitable for certification tubers must not weigh less than three ounces or more than six ounces.

Seed of "good color" means seed which is naturally bright and glossy and which has not been noticeably discolored by the weather or otherwise. Under certain circumstances seed which is slightly discolored but of high vitality may be allowed to pass.

By seed which is "free from disease" is meant seed which on field and laboratory inspection has been found, in the case of cereal grains, to be free from smut or other diseases which may be considered of a serious nature. In potatoes absolute freedom from the diseases specified under the "Destructive Insect and Pest Act" is insisted on, while in the case of minor diseases (Common Scab, Silver Scurf, etc.) not more than 5% of the total number of tubers may show traces of disease. It is alsc urged in the case of potatoes, that the tubers be stored prior to sale, free from contamination.*

List of Weeds Considered "Noxious" Under Seed Control Act.

The weeds coming within the meaning of the term "Noxious Weeds" as applied to the Seed Control Act are: Wild Oats, Common Darnel, Docks, Purple Cockle, White Cockle, Night-flowering Catchfly, Bladder Campion, Cow Cockle, Stinkweed, False Flax, Ball Mustard, Wild Radish, Wild Mustard, and other Wild Brassica species, Hare's Ear Mustard, Tumbling Mustard, Wild Carrot, Field Bindweed, Dodder in Alfalfa, Blue Bur or Stickseed, Blue Weed, Ribgrass, Ox-eye Daisy, Canada Thistle, Chicory, Sow Thistles.

*The Standards of quality and purity required for the registration of potatoes are based on the definition of "Seed Potatoes" as suggested by the Dominion Botanist. This definition reads as follows: "Seed Potatoes may be defined as potatoes consisting of whole sound tubers, true to name and type and of one named variety only; containing no tubers less than 3 oz. or more than 6 oz. in weight: free from (specified) diseases, produced in accordance with standard rules on individual premises free from such diseases; harvested and stored until sale free from any contamination; containing not more than 5% of common scab and other minor diseases not impairing their quality for seed purposes, and which are to be sold only in sealed containers, plainly labelled "Seed Potatoes."

Percentage Germination Standards.

The percentage germination standards for good seed, recognized under the Seed Control Act, are:—

	Percentage Germination
Cereals grains, Flax, Indian Corn and Millet	95
Peas, Beans and Vetches	90
Red Clover, Alfalfa, Alsike, White and other Clovers	95
Timothy, Cocksfoot and Meadow Fescue	90
All other Grasses	80
Mangel and Beet (160 Sprouts from 100 Balls)	90
Turnip, Swedes, Rape, Radish, Cabbage and Cauliflower	90
Spinach and Carrot	80
Celery, Parsnip and Parsley	65
Cucumber, Melon, Squash and other cucurbits	90
Onion, Leek and Tomato	90
Lettuce	95

The Inspection and Sale of Registered Seed.

In order to insure that a given lot of seed complies fully with the above standards it is absolutely necessary that the growing crop be inspected. Where seed is offered for sale it is also necessary that the cleaned seed be examined and the purity, quality and general condition verified. A copy of the form on which the inspector reports the results of his field examination in the case of cereal grains is appended. (See page 41.) In the case of potatoes a different form is used. In this case careful observations must be made regarding the colour of the flowers and the general characteristics of the plants. At digging time the uniformity in the shape, size and general varietal

Photo by L. H. N.

Inspector examining a Multiplying Field of Oats.

Canadian Seed Growers' Association

REPORT OF FIELD INSPECTION

(SPECIAL FORM FOR WHEAT, OATS, BARLEY, PEAS, BEANS AND FLAX)

Name of Member .....

Address (P.O.) ..... *Prov.*

Kind of Grain ..... *Variety* .....

	FIELD SCORES				
	Possible Score	Hand-Selected Seed Plot	Multiplying Fields*		
			No. I	No. II	No. III
		Score Awarded	Score Awarded	Score Awarded	Score Awar'd
General appearance considering :—					
(1) Stand of crop	5				
(2) Vigor and uniformity of growth	10				
(3) Type of plant considering strength of straw, etc	5				
Freedom from weeds	25				
(Names of weeds found in each field :—					
Freedom from smut, rust, blight and insects	10				
(Names of diseases or insects found in each field :—					
Freedom from other varieties and other kinds of grain. (Names of other kinds and varieties of grain found in each field :—	20				
Apparent yield and quality of grain considering :—					
(1) Proportion of well filled heads or pods of plump grain of good quality	20				
(2) State and uniformity of maturity	5				
Total	100				
Size of each of the above areas (acres)					
Amount of seed likely to be offered for sale from each area					
Suitability of seed for registration					
Year in which the seed sown, in the case of each field, originated as the general product of a hand selected Seed Plot					

*Where more than three (3) Fields are devoted to the multiplication of a given strain a new sheet should be used, and the additional fields numbered consecutively from and including No. IV.

General Condition of farm .....

.....

Remarks .....

.....

.....

Signed .....

Inspector.

Date of Inspection : ..... 19.....

Score Card used by Inspector in connection with field inspection of cereal grains.

characteristics of the tubers should be noted. If an inspector cannot be present at digging time the grower should note these matters carefully and report upon them. By these means the trueness to variety is ascertained.

In the case of potatoes the two important considerations are *pureness of variety* and *freedom from disease*. There are certain potato diseases which manifest themselves in the growing plants but which do not show on the tubers, e.g. Leaf Roll, Mosaic disease, Curly Dwarf, etc. This fact emphasizes the necessity of careful field inspection by an expert.

The final inspection of seed intended for registration and sale is made in the winter and early spring except in the case of autumn sown grains. Before making this inspection the grower is required to send a representative sample of about one quart in the case of cereals to headquarters, for examination. If this sample is found to be up to standard in all particulars the inspector will retain a part of it with which to compare the main bulk held in sacks on the owner's premises. If the seed offered agrees with the sample, the former is accepted and the sacks, barrels or crates as the case may be are closed and a metallic seal attached over a printed tag. This tag bears the name of the variety, the certificate number, the grower's signature and the Inspector's signature. By means of a coupon attached to these tags the grower is able to submit a "statement of transfer" of all seed sold. By this means the Association knows where all seed goes and can follow it up and ascertain how it has performed. This information is valuable not only in affording a check on the quality of the seed which each grower is selling, but in providing data regarding the value of registered seed generally.

Complaints and Disputes. — Should any dispute or dissatisfaction arise concerning the disposition of seed by members the course of procedure to be taken by the persons concerned shall be in accord with that stipulated in the Seed Control Act, Section 19. All other provisions of this Act which concern the disposition of seed shall apply to members of this Association.

Inspection Fees.

1. Where seed is inspected and sealed in sacks or other containers, the following fees are charged:—

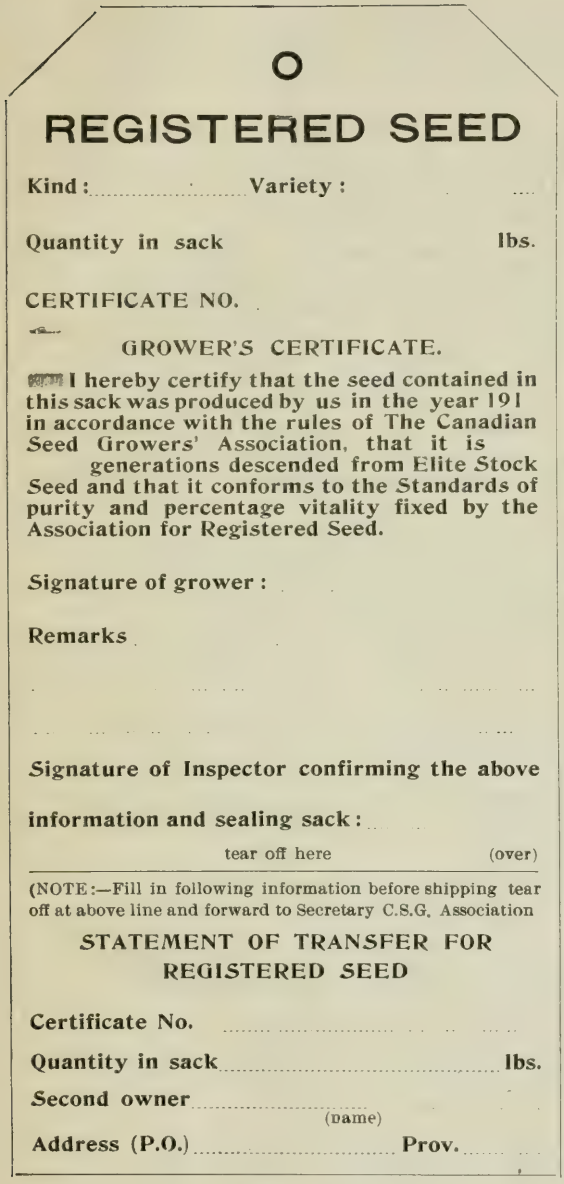
(a) For each bushel up to and including 200 bushels, 2 cents per bushel.

(b) For all quantities exceeding 200 bushels, 1 cent per bushel, or if member prefers, $4.00 per day for each day the inspector is on the premises.

2. When more than one visit to a given point is necessary to complete the sealing, an additional charge of $2.00 for such visit and for each succeeding visit is made.

Advertising of Registered Seed.

All seed which is grown according to the rules and which has passed the necessary inspection of the Association to date is, if offered for sale, listed in a seed catalogue which is issued by the Association and distributed widely



O

REGISTERED SEED

Kind: ..... Variety: ....

Quantity in sack ..... lbs.

CERTIFICATE NO. .

GROWER'S CERTIFICATE.

I hereby certify that the seed contained in this sack was produced by us in the year 191 in accordance with the rules of The Canadian Seed Growers' Association, that it is generations descended from Elite Stock Seed and that it conforms to the Standards of purity and percentage vitality fixed by the Association for Registered Seed.

Signature of grower: .

Remarks .

. ...

. ...

Signature of Inspector confirming the above information and sealing sack: ...

tear off here (over)

(NOTE:—Fill in following information before shipping tear off at above line and forward to Secretary C.S.G. Association

STATEMENT OF TRANSFER FOR REGISTERED SEED

Certificate No. ....

Quantity in sack ..... lbs.

Second owner .....
(name)

Address (P.O.) ..... Prov. ... .

FRONT

O

NOTE TO PURCHASERS.

Purchasers of this seed who wish to take up the growing of Registered Seed on their farms or who desire special information regarding the production of high class seed, should communicate with the Secretary, Canadian Seed Growers' Association, Canadian Building, Ottawa. In all cases the number of the Certificate issued for the seed purchased (see opposite side) should be specified as it may be possible to use this seed to advantage as foundation stock.

BACK

Front and Back views of Registration Tags which are attached by the Association to packages or sacks of Registered Seed before these leave the premises of the different growers.

throughout Canada. This catalogue contains, among other things, a list of the names and addresses of all growers who have seed to sell, the price they are asking and the official germination test of each lot. By this arrangement, prospective purchasers are able to locate those having good seed to sell to the mutual benefit of both.

Each grower who has any considerable quantity of seed to sell is also advised to advertise it himself. Special price lists, ad's in agricultural and other papers, correspondence with dealers, etc., are all useful for the above purpose. Excellent advertising facilities are also provided at the Annual Seed Exhibitions which are held in each district or province in Canada, and which last from two days to one week. Growers who are able to attend these exhibitions themselves are often able to place many orders from the sample they are showing. With the control which the Association now has over Registered Seed it is reasonably safe to buy from sample in the above manner.

Advantages of Affiliation With the Association.

While the grower may apply the above system of seed growing on his farm quite independent of the Association, yet there are certain advantages associated with an affiliation with this organization which are worthy of consideration. Briefly speaking, the Association is helpful in the following matters:—

1. It enables the member to keep in touch with his fellow worker, and thus to profit by the successes and failures of the latter.

2. Through its publications it keeps the members in touch with the best thought of the times in all matters pertaining to crop raising.

3. It fixes approximate standards of registration for registered seed.

4. It makes a careful study of the results obtained by the different members as well as by professional investigators, and offers direction and guidance accordingly.

5. It keeps the records of all work done along these lines by members, and issues certificates of registration.

6. It assists members in the disposal of their surplus stock of Registered seed.

7. It gives publicity to the work of worthy growers who have succeeded in producing stock of real merit, and which might otherwise remain unrecognized.

8. It provides or obtains prizes for competition with seed produced according to regulations by its members.

9. It gives the grower and his seed public recognition and affords a valuable means of advertisement.

10. It enables the member to ask a price commensurate with the quality of the goods offered.

11. It facilitates the wider distribution of high-class seed.

DEFINITIONS OF TERMS USED BY THE CANADIAN SEED GROWERS' ASSOCIATION.*

1. By the term "Hand-Selected Seed" is meant cleaned seed obtained from heads, panicles, pods, ears, or, in the case of potatoes, tubers which are uniform in character and which have been selected by hand from plants which are sound, vigorous and normally developed.

2. By the term "Hand-Selected Seed Plot" is meant a piece of land bearing a crop produced "directly" from hand-selected seed.

3. By the term "Elite Stock Seed" is meant:—

(a) A pure stock of seed produced on a hand-selected seed plot and which is considered by the executive to be worthy of distribution, or

(b) A pure stock of seed originating from a single plant, the progeny of which has been proven in plot or field tests (and by other means of examination) to the satisfaction of the executive and is considered worthy of distribution. This seed must have been propagated exclusively by the originator or under his supervision.

4. By the term "Multiplying Field" is meant a piece of land devoted to the multiplication of Elite Stock Seed or the progeny thereof up to and including the third generation.

5. By the term "Registered Seed" is meant the progeny of Elite Stock Seed, up to and including the third generation descended therefrom when such progeny has been grown and handled in accordance with the rules of the Association and has been duly accepted for registration.

6. By the term "Improved Seed" is meant seed originating from hand-selected seed but which is not yet entitled to public recognition as "Registered Seed", or, because of some deficiency, is not being handled as "Registered Seed."

*The terms here used were adopted by the Association at its Eighth Annual Meeting, all other terms being revoked.

THE CANADIAN SEED GROWERS' ASSOCIATION.

CONSTITUTION AND BY-LAWS.

Constitution.

1. The name of this Association shall be the Canadian Seed Growers' Association; it may have a common seal and alter the same at pleasure; may hold real and personal estate and receive grants and devices of the same; may appoint general and executive officers and define their duties; may receive, reject or suspend members; may stablish branch associations and may, from time to time, make rules, regulations and by-laws for the government of the Association and the management of its affairs.

2. The members of this Association may form branch associations for the provinces and districts for the purpose of assisting in carrying the objects of this Association into effect, provided the organization of such branch associations has been authorized by this Association, and their constitution and by-laws have been submitted to and approved by the Board of Directors of this Association.

Objects.

3. The object of this Association is to advance the interest of seed growers and other farmers by:—

(a) Making regulations respecting the growing, selecting and preserving of seed of various kinds of farm crops for the guidance of its members;

(b) Causing records to be kept of the history of seeds produced by members.

(c) Fixing standards for seeds that may be eligible for registration.

(d) Publishing information as to standards.

(e) Issuing certificates of registration to members by which hand-selected seed or the product thereof may be distinguished from other seed.

(f) Such other means as may be expedient from time to time.

Officers.

4. The general officers of the Association shall consist of a president, a secretary-treasurer, and nine directors appointed by the Provincial Departments of Agriculture (one by each) and ten other Directors elected by the Association.

5. The president and ten directors shall be elected each year at the annual meeting of the Association.

6. Three vice-presidents shall be elected by and from the completed Board of Directors.

7. The Secretary and Treasurer shall be appointed by the Board of Directors.

8. The officers and directors of the Association shall form the Board of Directors of the Association.

9. The Executive Council of the Association shall consist of the President, the Secretary and Treasurer and five directors to be elected by the Board of Directors.

Membership.

10. The Association may admit as members any persons or regularly organized body of persons resident in Canada who may choose to make seed growing a special branch of their farming operations, and who conform to the by-laws and regulations of the Association.

11. The Association may admit as honorary members persons who may be directly or indirectly interested in agriculture in Canada but who may not be producers of seed, and such honorary members shall be eligible to hold office or otherwise enjoy all the privileges provided for members of the Association.

12. Applicants for membership in this Association may be admitted by vote at any meeting of the Association or of the Executive Council. Any applicant for membership shall become a member of this Association when duly elected by vote of the officers and members or by vote of the Executive Council.

BY-LAWS AND REGULATIONS.

Notice of Meetings.

13. The Executive Council shall cause notices of meetings of the Association to be sent to each of the members at least twenty days prior to the date named for holding the meeting.

14. The President shall cause a notice of any regularly held meeting of the Board of Directors to be sent to each of the members of the said body at least ten days before the date named for holding the meeting.

(b) The President shall cause a notice of any meeting of the Executive Council to be sent to each of the members of the said body at least ten days before the date named for holding the meeting.

Meetings of the Association.

15. The Association year shall commence on the 1st of April.

16. The Association shall hold at least one meeting each year, the time and place of meeting to be named by the Executive Council.

17. If, from any cause, the Annual Meeting of the Association be not held before the end of the Association year, or due notice thereof be not given, the Executive Council shall cause a special meeting to be called as soon after the end of the Association year as possible, for the purpose of transacting the business of the Annual Meeting, and at such meeting all matters may be dealt with and acted upon as if such meeting were in fact the Annual Meeting of the Association.

18. The usual order of business for the Annual Meeting of the Association shall be:—

The reading and disposal of the minutes of the last meeting.

The reading and disposal of communications.

Report of the Board of Directors.

Reports of the Committees appointed by the Association.

Report of officers.

Unfinished business.

Nomination and election of members of the Association.

Election of the Board of Directors for the ensuing year.

New business.

Meetings of the Board of Directors.

19. The Board of Directors shall hold meetings at such time and place as may be deemed necessary by the President.

At its first meeting, the completed Board shall elect the three vice-presidents and the Executive Council.

20. The usual order of business for the regular meetings of the Board of Directors shall be:—

The reading and disposal of the minutes of the last meeting.

The reading and disposal of communications.

Report of the Executive Council.

Report of the Committees appointed by the Board of Directors.

Unfinished business.

New business .

Quorum.

21. Fifteen members of the Association shall constitute a quorum for the transaction of business at any meeting of the Association of which due notice has been sent to members as heretofore provided.

22. Seven members of the Board of Directors of this Association shall constitute a quorum for the transaction of business at any regular meeting of the Board of Directors.

Powers and Duties of tht Board of Directors.

23. The decisions of the Board of Directors on any matters pertaining to the workings of the Association or to branch associations shall be final.

It shall be the duty of the Board of Directors to:—

(a) Direct the operations of the Association.

(b) Make recommendations regarding the revision of the constitution, by-laws and regulations as they may from time to time see fit.

(c) Define the scope of work for this Association and for any branch association that may be formed.

(d) Authorize, whenever they may see fit, the formation of branch associations.

(e) Suspend or expel members who may be found guilty of violating any provisions of the constitution, by-laws or regulations of the Association.

(f) Consider and decide upon any appeals that may be made from any rulings of any person or body connected with this Association or any branch Association.

(g) Consider any appeals or recommendations that may be made by any branch Association.

(h) Define the course to be followed in the keeping of records of seed produced by members.

(i) Define the course to be followed in the issuing of certificates of registration to members.

(j) Define the course to be followed in issuing catalogues or otherwise advertising seed produced by members.

(k) Take such action as may at any time seem to them advisable in the carrying on of the work of the Association, and in the encouraging of the production and use of high-class seeds of any or all kinds of farm crops.

Executive Council.

24. It shall be the duty of the Executive Council to transact the business of the Association between meetings of the Association and between meetings of the Board of Directors.

President.

25. It shall be the duty of the President to preside at all meetings of the Association and of the Board of Directors, and to give the casting vote in case of a tie.

Vice-Presidents.

26. It shall be the duty of the vice-presidents to aid and assist the President. In the absence of the President, his duties shall devolve on a vice-president.

Secretary.

27. It shall be the duty of the Secretary to attend all meetings of the Association, the Board of Directors and the Executive Council, and keep correct minutes of the same; to send notices of meetings to members; to issue all publications; to keep records of the seed produced by members and to issue certificates of registration as directed by the Board of Directors.

Duties of Members.

28. Each member shall operate annually a hand-selected seed plot in accordance with methods approved by this Association for the purpose of maintaining a constant supply of "Elite Stock Seed."

Regarding the Registration of Seed.

29. This Association shall cause records to be kept of seed of wheat, oats, barley, vetches, pease, beans, maize, millet, flax, seed-potatoes (tubers) and such other crops as the Association may decide to accept for registration when the said seed has been grown and handled in accordance with the rules of the Association.

30. All plots and fields producing seed intended for registration, together with the seed obtained from such plots and fields, are subject to the inspection of officers duly authorized by the Association.

31. Certificates of registration may be issued to members for seed of approved varieties grown by them or under their control in accordance with the methods of the Association when such seed has qualified for recognition as "Elite Stock Seed" or as "Registered Seed" as these classes of seed are defined by the Association. (See Definition of Terms).

32. When certificates of registration for which application has been made by any member are withheld, the Secretary of the Association shall issue a statement setting forth the reasons therefor, which statement shall be sent to the said member by registered mail within ten days after the receipt of his application for the said certificates.

33. The Executive Council shall cause blank forms to be issued in duplicate at an opportune time each year to members and applicants who shall fill them out as fully as possible with the information asked for and attach their signatures thereto, thereby certifying their correctness. One of these forms shall be returned to the Secretary-Treasurer of the Association and the other may be kept by the member for future reference.

Inspection.

34. Members will at all times endeavour to assist the general officers or any person or persons whom the Executive Council or the President may appoint to enquire into or inspect the operations of members in the growing, selecting, preserving or disposing of any seed intended for registration or for which certificates of registration are issued.

Head Office.

35. The head office of the Association shall be in the City of Ottawa in the Province of Ontario.

Auditors.

36. Two auditors shall be appointed to examine the accounts of the Association, one of whom shall be appointed by the Department of Agriculture and the other by the Board of Directors.

Classified List of Selected Articles and Publications which Deal in a Practical or Semi-Scientific Manner With the Work of Plant Improvement, etc.

1. General.

Addresses by the President of the C.S.G.A., Dr. Jas. W. Robertson, at the annual meetings for 1905-15 inclusive. See C.S.G.A. Reports for the years indicated.

Addresses by Hon. Sydney Fisher at the annual meetings for 1905-08 inclusive, also for 1910. See C.S.G.A. Reports for the years indicated.

Papers by the District Representatives of the Dominion Seed Branch presented at each annual meeting. See Annual Reports.

"Scope of work of the Canadian Seed Growers' Association" by Mr. G. H. Clark, Seed Commissioner, Ottawa. See 2nd Annual Report of the C.S.G. Association, page 44.

"Some common principles which underlie improvement in animals and plants," by J. H. Grisdale, B. Agr., Ottawa, 2nd Annual Report of the C.S.G.A., page 92.

"The seedsman and the C.S.G.A." by S. E. Briggs, Toronto, See 7th Annual Report of the C.S.G.A., page 96.

"Methods of giving publicity to the proceedings and achievements of the Canadian Seed Growers' Association" by Wm. Thompson, London, Ontario. See 2nd Annual Report of the C.S.G.A., page 100.

Addresses, Hon. W. R. Motherwell, Minister of Agriculture, Regina. See 3rd Annual Report of the C.S.G.A., page 51, also 4th An. Report, page 46.

"The commercial value of good seed" by John Mooney, Regina, Sask. See 6th Annual Report of the C.S.G.A., page 111.

"The educational value of a hand-selected seed plot for boys and girls" by W. L. Ramsay, Bladworth, Sask. See 7th Annual Report of C.S.G.A., page 67.

"The commercial value of the work of the Canadian Seed Growers' Association" by Geo. H. Bradshaw, Morden, Man. See 7th Annual Report of the C.S.G.A., page 69.

Address, by the Hon. Martin Burrell, Minister of Agriculture, Ottawa. See 8th Annual Report of the C.S.G.A.

Systems of Crop Raising and the Production of Pure Seed on the Dominion Experimental Farms," by J. H. Grisdale, Director of Experimental Farm, Ottawa, Ont. See 11th Annual Report of the C.S.G.A., p. 41.

"Work of the C.S.G.A. in Saskatchewan," by H. N. Thompson, Regina, Sask., Weeds and Seed Commissioner for Saskatchewan. See 11th Annual Report of C.S.G.A., page 114.

"The Canadian Seed Growers' Association in British Columbia," by J. C. Ready, Chief Soil and Crop Instructor for B.C., Victoria, B.C. See 11th Annual Report of C.S.G.A., page 122.

"The Interpretation of Plot Experiments," by Chas. Saunders, Ph.D., Dominion Cerealist, Ottawa. See 11th Annual Report of C.S.G.A., p. 48.

"The Work of the Dominion Seed Branch," by Geo. H. Clark, Seed Commissioner, Ottawa. See 11th Annual Report of S.C.G.A., p. 55.

"Seed Improvement in Prince Edward Island," by J. A. Clark, Charlottetown, P.E.I. See 11th Annual Report of C.S.G.A., p. 60.

"Seed Growing in Nova Scotia," by W. L. MacFarlane, Fox Harbour, N.S. See 11th Annual Report of the C.S.G.A., p. 66.

Addresses by Prof. C. C. James, Toronto, Ont. See 8th and 11th Annual Reports of the C.S.G.A.

"Vocational Agricultural Education for Boys and Girls," by Mr. Rufus Stimson, Special Agent for Agricultural Education, Boston, Mass. See 8th Annual Report of the C.S.G.A.

†The annual reports of the American Genetic Association, 511 Eleventh St., Northwest, Washington, D.C., U.S.A. Membership, including annual reports, $2.00 per annum.

Annual Reports of the Central and Branch Experimental Farms, Ottawa, Ont.

†Annual Reports of the Agricultural Colleges at Guelph, Ont., Truro, N.S., St. Annes, Que., and Winnipeg, Man.

"The Canadian Seed Growers' Association and the Farmer," by Leon Gerin, Coaticook, Que. See 4th Annual Report of the C.S.G.A., p. 87.

"Conditions which effect the vitality and vital energy of seeds," by George Michaud, Assistant Seed Analyst, Ottawa. See 5th Annual Report of the C.S.G.A., p. 63.

"The seed plot as an educator," by Mr. J. W. Gibson, Ottawa. See 5th Annual Report of the C.S.G.A., p. 96.

"Some essentials for success in seed growing," by J. R. Oastler, Minister's Island, N.B. See 5th Annual Report, p. 102.

"Gleanings from field work in the inspection of seed plots of fellow members," by Donald Innes, Tobique River, N.B. See 5th Annual Report of the C.S.G.A., p. 105.

Address by Prof. W. J. Black, Agricultural College, Winnipeg, Man. See 6th Annual Report of the C.S.G.A., p. 86.

Address by Theodore Ross, Charlottetown, P.E.I. See 6th Annual Report of the C.S.G.A., p. 87.

"The Object of the C.S.G.A. and How to Get the Farmers Interested," Donald Innes, Tobique River, N.S. See 9th Annual Report of C.S.G.A., p. 97.

"Home-Grown Seed vs. Imported Seed." R. D. Mackay, Balmoral Mills, N.S. See 9th Annual Report of C.S.G.A., p. 98.

"What Can the Rural School Do to Promote an Active Interest in the Production of Pure Seed in Canada," by Prof. S. B. McCready, O.A.C., Guelph. See 10th Annual Report of C.S.G.A., p. 48.

"Field Crop Competitions and Their Value in Connection with the Good Seed Movement," by J. Lockie Wilson, Toronto, Ont. See 10th Annual Report of C.S.G.A., p. 56.

"Relationship Between the Work of the C.S.G.A. and that of the Experimental Farms," W. C. McKillican, Brandon, Man. See 9th Annual Report of C.S.G.A., p. 125.

2. Seed Selection.

"Some results in horticulture from the selection of seeds," by Mr. George Robertson, St. Catharines, Ont. See 3rd Annual Report of the C.S.G.A., page 84.

"Some observations during several years of Seed selection," by Robert MacKay, Millsville, N.S. See 6th Annual Report of the C.S.G.A., page 88.

"Some results from seed selection," by James Marchbank, New Annan, P.E.I. See 6th Annual Report of the C.S.G.A., page 89.

"Does it pay to operate a special seed plot?" by Richard Creed, Albion, P.E.I. See 6th Annual Report of the C.S.G.A., page 70.

"A means of increasing Agricultural production," by E. D. Eddy, Seed Branch, Ottawa. See 6th Annual Report of the C.S.G.A., page 91.

"The choice of foundation stock and its importance," by Chester Nicholson, Mount Forest, Ont. See 6th Annual Report of the C.S.G.A., p. 96.

"Evidence of improvement in farm crops by selection," by Prof. C. A. Zavitz, O.A.C., Guelph. See 2nd Annual Report, page 70.

"What can the farmer do to improve the yield and quality of his grain," by H. Snyder, St. Anthony Park. See 2nd Annual Report of the C.S.G.A., page 77.

"The special seed plot vs. the general field as a source of good seed," by W. A. A. Rowe, Neepawa, Man. See 5th Annual Report of the C.S.G.A., page 108.

"Some results obtained from the careful selection of seeds," by:—

(a) Geo. Dow, Gilbert Plains, Man. 5th Annual Report, page 109.

(b) T. Turnbull, Manitou, Man. 5th Annual Report, page 111.

"The scope open for the production of highly bred seed in Manitoba," by John Mooney, Regina, Sask. See 5th Annual Report of the C.S.G.A., page 112.

"The value of careful Seed Selection in maintaining the standard of our crops," by A. Cooper, Treesbank, Man. See 6th Annual Report of the C.S.G.A., page 101.

"Seed Improvement and Agricultural Extension Work," by E. A. Howes, Vermilion, Alberta. See 11th Annual Report of the C.S.G.A., page 118.

"Plant breeding on the farm," by Seager Wheeler, Rosthern, Sask. See 6th Annual Report of the C.S.G.A., page 107.

"Nine years' experience in seed selection in Saskatchewan," by F. J. Dash, Hillesden, Sask. See 6th Annual Report of the C.S.G.A., page 109.

"How I discovered and propagated an early strain of Red Fyfe wheat," by Geo. L. Smith, Saskatoon, Sask. See 6th Annual Report, page 110.

"Seed selection and the farmer," by Harry R. Brown, Wallace Bay, N.S. See 6th Annual Report of the C.S.G.A., page 47.

"Some essential features to be observed in the hand-selection of wheat," by John Mooney, Regina, Sask. See 6th Annual Report of the C.S.G.A., page 66.

"Some essential features to be observed in the hand-selection of oats," by George Dow, Gilbert Plains, Man. See 6th Annual Report of the C.S.G.A., page 72.

"Results obtained from hand-selected seed," by J. L. Henry, Beaver, Man. See 6th Annual Report of the C.S.G.A., page 79.

"The educational value of a seed plot," by Prof. E. S. Archibald, Truro, N.S. See 7th Annual Report of the C.S.G.A., 45.

"The Production of Seed of Alfalfa in Canada," by Prof. C. A. Zavitz, O.A.C., Guelph. See 10th Annual Report of C.S.G.A., page 41.

"Selection of Beans," by H. G. Schmidt, Madawaska, Ont. See 10th Annual Report of C.S.G.A., page 114.

"Five Years' Experience in Seed Improvement Work," by Wm. Lewis, Dunsford, Ont. See 9th Annual Report of C.S.G.A., page 106.

"The Choice of Foundation Stock and its Importance," by Fred Foyston, Minesing, Ont. See 9th Annual Report of C.S.G.A., page 109.

"Thickness of Seeding in Cereal Grains," by Prof. C. A. Zavitz, O.A.C., Guelph. See 9th Annual Report of C.S.G.A., page 39.

"Report on Three Years' Experiment in Thickness of Seeding in Cereal Grains," L. H. Newman, Secretary, C. S. G. A., Ottawa. See 9th Annual Report of C.S.G.A., page 45.

Statistics on the Production, Selection and Cleaning of Seed on Canadian Farms," by F. C. Nunnick, Agriculturist for Commission of Conservation, Ottawa, Ont. See 9th Annual Report of C.S.G.A., page 53.

"Results on Two Years' Work in Testing Field Root Seeds of Commerce to Prove Genuineness of Stock," by E. D. Eddy, Chief Seed Inspector, Ottawa, Ont. See 9th Annual Report of C.S.G.A., page 62.

3...Re Wheat, Oats and Barley.

*"Wheat growing in the Canadian West," by Hon. W. R. Motherwell, Regina, Sask. See 3rd Annual Report of the C.S.G.A., page 55.

"Quality in Wheat," Bulletin 57, by Dr. C. E. Saunders and Prof. F. T. Shutt, Dominion Experimental Farms, Ottawa.

"The quality of wheat as influenced by certain soil conditions," by Prof. F. T. Shutt, Chemist, C. E. Farm, Ottawa. See 4th Annual Report of the C.S.G.A., page 52.

"Observations on the breadmaking qualities of flour made from different varieties of Ontario Fall wheats," by Prof. R. Harcourt, O.A.C., Guelph, Ont. See 4th Annual Report of the C.S.G.A., page 69.

"The influence of environment on the Composition of Wheat," by Prof. F. T. Shutt, C. E. Farm, Ottawa. See 6th Annual Report of the C.S.G.A., page 69.

"How I Produced the World's First Prize Hard Wheat," by Paul Gerlach, Allen, Sask. See 10th Annual Report of C.S.G.A., page 116.

Address by Dr. Charles Saunders, Ottawa, Ont. See 9th Annual Report of C.S.G.A., page 111.

"The Growing of Pure-bred Marquis Wheat," by Donald MacVicar, Portage la Prairie, Man. See 11th Annual Report of C.S.G.A., page 112.

"Ten Years Experience in the Growing of Spring Wheat in Glengarry Co., Ont," by Robert MacKay, Maxville. See 6th Annual Report of the C.S.G.A., page 97.

*"Our Common Barleys and the field open for their improvement in Canada," by Mr. A. P. McVannel, Picton, Ont. See 5th Annual Report of the C.S.G.A., page 86.

"Grades of Wheat," Bulletin 60, by Dr. C. E. Saunders and Prof. F. T. Shutt, Dominion Experimental Farms, Ottawa, 1908.

"Working towards an ideal in Banner Oats," by Geo. Gow, Gilbert Plains, Man. See 11th Annual Report of the C.S.G.A., page 106.

4...Corn.

"Corn Breeding in the Corn Belt,"by Prof. L. S. Klinck, St. Annes, P.Q. See 2nd Annual Report of the C.S.G.A., page 56.

*"Methods of Storing Seed Corn," by Prof. L. S. Klinck, St. Annes. See 3rd Annual Report of the C.S.G.A., page 91.

*"Improvement of Corn in Canada," by Prof. L. S. Klinck. See 5th Annual Report of the C.S.G.A., page 76.

"Some Results Obtained in the Work of Corn Improvement and the demand for high class Seed Corn," by L. D. Hankinson, Grovesend, Ont. See 6th Annual Report of the C.S.G.A., page 92.

"Seven Years' Experience in Selecting Corn to meet the climatic conditions of Manitoba," by E. R. James, Rosser, Man. See 7th Annual Report of the C.S.G.A., page 74.

†Annual Reports, Ontario Corn Growers' Association, Dept. of Agriculture, Toronto.

†Corn Breeding in Minnesota,—Bull. 107; Agricultural Experiment Station, St. Anthony Park, Minn., 1908.

†Selecting and Preparing Seed Corn.—Bull. 77, Iowa State College, Ames, Iowa, 1904.

"Growing and using corn for ensilage,"—Bulletin 65, by J. H. Grisdale, B. Agr., Dominion Experimental Farms, Ottawa, 1910.

"Progress in High Class Seed Corn Improvement in Western Ontario and some Practical Suggestions as to How the Product may be Handled to Better Advantage," by L. D. Hankinson, Aylmer, Ont. See 9th Annual Report of C.S.G.A., page 117.

"The Seed Corn Centre as a Factor in the Production of Registered Seed in Commercial Quantities," by T. J. Shepley, Amhertsburg, Ont. See 10th Annual Report or C.S.G.A., page 111.

"The Seed Corn Situation in Ontario," by W. J. W. Lennox, Toronto. See 11th Annual Report of the C.S.G.A., page 94.

"The Seed Corn Centre as a Source of Registered Seed in Commercial Quantities," by Will C. Barrie, Galt, Ont. See 11th Annual Report of C.S.G.A., page 87.

5. Potatoes.

*"The improvement of the Potato," by W. T. Macoun, C. E. Farm, Ottawa. See 3rd Annual Report of the C.S.G.A., page 77.

"The Importance of Selecting Seed Potatoes," by W. E. Turner, Duval, Sask. See 10th Annual Report of C.S.G.A., page 119.

"Potatoes as a C.S. G. A. Crop," by W. J. G. Hall, Blucher, Sask. See 9th Annual Report of C.S.G.A., page 130.

"Four Years' Experience in the Hand-Selection of Seed Potatoes," by C. F. Fawcett, Sackville, N.B. See 9th Annual Report of C.S.G.A., page 96.

"Improvement of Hoed Crops," by Charles Pearce, Welington, Ont. See 9th Annual Report of C.S.G.A., page 108.

"The Selection of Seed Potatoes," by Harry Brown, Wallace Bay, N.S. See 5th Annual Report of the C.S.G.A., page 103.

"Some Experiences in Crop Raising with Special Reference to the Potato," by W. H. Taylor, St. Giles, Que. See 6th Annual Report of the C.S.G.A., page 63.

"Some Results Obtained in the Improvement of the Potato," by Alfred Hutchison, Mount Forest, Ont. See 6th Annual Report of the C.S.G.A., page 96.

"Potato Breeding in Manitoba and Some Results Obtained," by Harold Orchard, Lintrathen, Man. See 6th Annual Report of the C.S.G.A., page 103.

"The Potato and its Culture,"—Bulletin 49, Dec. 1910, by W. T. Macoun, C. E. Farm, Ottawa.

†"Potato Growing in Ontario," 1906 Report Farmers' Institutes for Ontario, Department of Agriculture, Toronto, Ont.

†"The Potato"—(Book), by Samuel Fraser, Cornell University, Orange Judd Co., N.Y.,—1905.

†"A study of the Factors influencing the improvement of the Potato," Bull. No. 127, by Edward M. East, Urbana, Ill., 1908.

6. Field Roots.

"Selection of Seed of Field Roots and Vegetable Crops in Canada," by Otto Herold, Waterloo, Ont. See 6th Annual Report of the C.S.G.A., page 72.

"The Growing of Turnip Seed in the Maritime Provinces," by Richard Creed, Albion, P.E.I. See 7th Annual Report of the C.S.G.A., page 49.

7. Seed Supply, Distribution and Control.

"Field Crops at the Experimental Farm and the Distribution of Seed so Obtained," by William Saunders, C.E. Farm, Ottawa. See 2nd Annual Report of the C.S.G.A., page 81.

*"How Best to Encourage the Dissemination of High Class Seed," by W. L. Smith, Toronto, Ont. See 3rd Annual Report of the C.S.G.A., page 92.

"Some Problems in Seed Control," by Geo. H. Clark, Seed Commissioner, Ottawa. See 4th Annual Report of the C.S.G.A., page 85.

"Seed Improvement in the Province of Quebec for the year 1914," by G. A. Gigault, Deputy Minister of Agriculture, Que. See 11th Annual Report of the C.S.G.A., page 73.

"Methods of Improving the Supply of Field Root and Vegetable Seeds," by Geo. H. Clark, Seed Commissioner, Ottawa, Ont. See 9th Annual Report of C.S.G.A., page 68.

Discussion on above paper by Thos. Delworth, Weston, Ont. See 9th Annual Report of C.S.G.A., page 71.

"The Production of Garden Vegetable Seeds in Canada," by W. T. Macoun, Dominion Horticulturist, Ottawa, Ont. See 9th Annual Report of C.S.G.A., page 74.

Discussion on above paper by Mr. Paul Bovin, Macdonald College, P.Q. See 9th Annual Report of C.S.G.A., page 86.

"Methods of Advertising and Selling Registered Seed," by W. D. Lang, Indian Head, Sask. See 9th Annual Report, page 137.

"How to Maintain Continuous Purity in Seed Cultures," by Geo. Dow, Gilbert Plains, Man. See 9th Annual Report of C.S.G.A., page 123.

"The Co-operative Seed Association of Quebec," by J. A. Simard, Que. See 11th Annual Report of the C.S.G.A., page 80.

"The Co-operative Seed Association of Quebec," by L. Lavallée, Ste. Guillaime, P.Q. See 11th Annual Report of the C.S.G.A., page 82.

"The Canadian Seed Growers' Association and the Seed Trade," by G. M. Michaud. See 10th Annual Report of C.S.G.A., page 103.

"The Seed Centre as a Basis of Supply of 'Registered Seed,' " by W. D. Jackson, Carp, Ont. See 10th Annual Report of C.S.G.A., page 85.

"The Production of Registered Seed in Commercial Quantities," by Jas. H. Bridge, M. A. C., Winnipeg, Man. See 11th Annual Report of C.S.G.A., page 110.

"Difficulties encountered in the Propagation of Pure Seed," by Dr. Chas. E. Saunders, Dominion Cerealist, Ottawa. See 10th Annual Report of C.S. G.A., page 75.

"Buying and Selling Co-operatively," by F. C. Hart, Toronto, Ont. See 11th Annual Report of the C.S.G.A., page 91.

"The Distribution of Improved Seed Stocks in Europe," by L. H. Newman, Sec.-Treas. of the S.C.G.A., Ottawa. See 7th Annual Report of the C.S.G.A., page 100.

"The Distribution of Seed Produced at Experimental Farms," by C. E. Saunders, of the Central Experimental Farm, Ottawa, Ont. See 8th Annual Report of the C.S.G.A.

8. Insects and Plant Diseases, Etc.

"The Action of Certain Smut Preventives on the Vitality of Wheat," by Prof. F. T. Shutt, Ottawa. See 2nd Annual Report of the C.S.G.A., page 47, also 3rd Annual Report, page 69.

"Insects and Fungous Enemies of Cereal Crops and Their Treatment," by Prof. W. Lochhead, McDonald College, Que. See 2nd Annual Report of the C.S.G.A., page 47.

"Address," by the late Dr. James Fletcher, C. E. Farm, Ottawa. See 2nd Annual Report of the C.S.G.A., page 103.

Potato Canker, Bull. 63 Exp. Farm, Ottawa, Ont.

"The Effect of Exposure on Solutions of Formaldehyde." See 4th Annual Report of the C.S.G.A., page 50.

Potato Diseases Transmitted by the use of unsound seed. Farmers' Circ. 4.

Powdery Scab of Potatoes, Farmers' Circ. No. 5.

"The Treatment of Grain for Smut," by William Lewis, of Dunsford, Ont. See 7th Annual Report of the C.S.G.A., page 54.

Smut Diseases of Cultivated Plants, Bull. 73, Exp. Farms, by H. T. Güssow, Dom. Botanist, Ottawa.

"Insects Injurious to Grain, Fodder Corn, Root Crops and Vegetables," Bulletin 52, by Dr. Jas. Fletcher, Dominion Experimental Farms, Ottawa, Ont., 1905.

"Powdery Scab of Potatoes," Circular No. 5, by J. W. Eastham, Ottawa, Ont.

"Potato Diseases and the Position of the Canadian Seed Growers' Association," by H. T. Güssow, Dominion Botanist, Ottawa. See 10th Annual Report of C.S.G.A., page 81.

9. Soils, Fertilizers, the Effects of Culture, Etc.

*"The Relationship Between Soil Conditions and Crop Improvement," by Prof. R. Harcourt, O.A.C., Guelph, Ont. See 3rd Annual Report of the C.S.G.A., page 55.

"Some Effects on Varieties of Cereal Crops Arising from Different Conditions of Growth," by J. Buchanan, O.A.C., Guelph, Ont. See 3rd Annual Report of the C.S.G.A., page 74.

"Some Soil Problems for the Grower of Improved Seed," by J. H. Grisdale, C. E. Farm, Ottawa. See 4th Annual Report of the C.S.G.A., page 92.

"Soil Cultivation and Crop Improvement," by W. H. Moore, Scotch Lake, N.B. See 4th Annual Report of the C.S.G.A., page 96.

"Cultivation of Land for the Production of High Class Seed," by W. H. English, Harding, Man. See 9th Annual Report of C.S.G.A., page 121.

"Soil Management in Relation to Yield and Quality in Seed," by Prof. L. S. Klinck, Macdonald College, P.Q. See 10th Annual Report of C.S.G.A., page 68.

"Surface Drainage versus Underdrainage," by W. H. Taylor, St. Giles, Que. See 7th Annual Report of the C.S.G.A., page 120.

*"Cultural Conditions for Seed Growing," by J. H. Grisdale, C. E. Farm, Ottawa. See 8th Annual Report of the C.S.G.A.

†"Western Prairie Soils: Their Nature and Composition," Serial No. 6 (25 pages), by Prof. F. T. Shutt, Dominion Experimental Farms, Ottawa, 1910.

†"Preparing land for Grain Crops in Saskatchewan," Pamphlet No. 3, by Angus McKay, Dominion Experimental Farms, Ottawa, 1909.

10. Weeds.

"The place of the Canadian Seed Growers' Association in the campaign against noxious weeds," by Dr. James Fletcher, C. E. Farm, Ottawa, Ont. See 4th Annual Report of the C.S.G.A., page 76.

"The Seed Control Act, 1911, with Regulations—Dominion Seed Branch, Ottawa, Ont.

"Reports of the Seed Commissioner, 1905-11--Dominion Seed Branch, Ottawa, Ont.

"Wild Oats and False Wild Oats, their Nature and Distinctive Characters," by Norman Criddle,—Bulletin No. S.7—Dominion Seed Branch, Ottawa, 1912.

Farm Weeds of Canada (coloured plates) For sale by single copies only, at the office of the King's Printer, Government Printing Bureau. (Price $1.) G. H. Clark, Dr. James Fletcher.

Selected List of Articles and Publications Which Deal with the Science of Plant Improveement and Development.

"Pedigree or Grade Breeding," by J. H. Webber, Washington, D.C. See 2nd Annual Report of the C.S.G.A., page 61.

"The Science of Plant Breeding," by Dr. J. H. Webber, Washington, D.C. See 2nd Annual Report of the C.S.G.A., page 79.

"Individuality in Plants," by Prof. L. S. Klinck, Macdonald College, Que. See 4th Annual Report of the C.S.G.A., page 78.

"The Work of Plant Improvement at Home and Abroad," by Prof. C. A. Zavitz, O.A.C., Guelph, Ont. See 4th Annual Report of the C.S.G.A., page 42.

"The Problem of Breeding Disease-Resistant Plants,—" Prof. W. Lochhead, Macdonald College, Que. See 4th Annual Report of the C.S.G.A., page 64.

*"The Production of Improved Varieties of Cereals," by Dr. C. E. Saunders, C. E. Farm, Ottawa. See 5th Annual Report of the C.S.G.A., page 81.

*"The Improvement of Farm Crops by the Selection of Individual Plants," by Prof. C. A. Zavitz, Guelph, Ont. See 5th Annual Report of the C.S.G.A., page 85.

*"How Plants Feed," by Prof. W. Lochhead, Macdonald College, Que. See 5th Annual Reports of the C.S.G.A., page 91.

*"Some of the factors which influence the productive capacity of seed," by George Bradshaw, Morden, Man. See 5th Annual Report of the C.S.G.A., page 106.

"Heredity in Plants and its Bearing on Agricultural Problems," by Prof. C. A. Zavitz, Guelph, Ont. See 6th Annual Report of the C.S.G.A., page 49.

"Hybridizing the Gladiolus," by H. H. Groff, Simcoe, Ont. See 6th Annual Report of the C.S.G.A., page 52.

"Seed Selection as Practised in Europe with Wheat, Oats and Barley," by G. H. Clark, Seed Commissioner, Ottawa. See 6th Annual Report of the C.S.G.A., page 81.

Discussion by Dr. C. E. Saunders, C. E. Farm, Ottawa. See 6th Annual Report of the C.S.G.A., page 84.

"The Importance of Choosing Suitable Varieties as Foundation Stock," by Ira Rodd, North Milton, Ont. See 6th Annual Report of the C.S.G.A., page 88.

†"Plant Breeding in Scandinavia," by L. H. Newman, Sec.-Treas. of the C.S.G.A., Ottawa, 1912. For sale at the office of the C.S.G.A., Canadian Building, Ottawa. Price $1.00 net, cloth $1.50.

"The Improvement of Fodder Plants by Selection," by Dr. M. O. Malte, Seed Branch, Ottawa. See 7th Annual Report of the C.S.G.A., page 100.

"The Improvement of Cereal Grains at Macdonald College," by Prof. L. S. Klinck, of Macdonald College. See 8th Annual Report of the C.S.G.A.

†"The relation of Certain Biological Principles to Plant Breeding,"—Bull. No. 158, Nov., 1907, by E. M. East, Ph.D., New Haven, Conn., U.S.A.

†"Mendel's Principles of Heredity" (Book), by Prof. W. Bateson, late Prof. of Biology, Cambridge University, Eng. Cambridge University Press, 1909. Price $3.00.

†"Mendelism" (Book), by R. C. Punnett, Professor of Biology, University of Cambridge, Eng. The Macmillan Company, N.Y. 1911. Price $1.25.

NOTE:—Those publications marked with an asterisk (*) are not available for general distribution; most of the others are available at the Publication Branch, Dept. of Agriculture, Ottawa, Ont., and may be had free of charge, on application. All except those marked with a dagger (†) are printed both in French and English.

To the Secretary-Treasurer:

Canadian Seed Growers' Association,
Canadian Building, Ottawa, Ont.

SIR,

I hereby make application to be admitted as a member of the Canadian Seed Growers' Association. It is my purpose to grow seed of ..... the
(Kind and variety of crop)
foundation Stock of which variety having been obtained by me from ..... in the year ..... . In the production and handling of this seed I agree to comply with the rules and by-laws of the Association to the best of my ability.

Signed .....
(Name in full)

..... 19 .....
(Date)

.....
(Post Office)

The farm on which this seed will be grown is situated as follows:

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County (In case of Eastern Canada) .....

Section (In case of Western Canada) .....

Township ..... Range ..... W. of ..... Mer.

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